JULY 25, 1955

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

Lighting Hits Its Stride

Utilities are giving lighting an important new place in their sales planning . . .

For a report of marketing problems, and how they are being faced, turn to page 91

See Also: AIEE Summer Meeting Report
Semi-Annual Editorial Index

6 YEARS... NEUT. NO. .06

MUNSINGWEAR, INC.,

Minneapolis, Minnesota, has lubricated this geared turbine with *Texaco Regal Oil R&O* since its installation in 1949. In its six years of service, there has been no trace of sludge, rust or foam in the system, and the neutralization number of the oil is only .06 at the present time.

Regardless of the size or type of turbine, *Texaco Regal Oil R&O* assures clean systems, normal bearing temperatures and instantaneous governor response throughout an exceptionally long oil service life. *Texaco Regal Oil R&O* is especially refined from the finest crudes, then further improved by effective additives and special processing.

There is a complete line of *Texaco Regal Oils R&O* to meet the exacting requirements of all leading turbine builders and all types and sizes of turbines.

A Texaco Lubrication Engineer will gladly give you more specific information. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N.Y.

TEXACO

TEXACO Regal Oils R&O

FOR ALL TURBINES

TUNE IN . . . TEXACO STAR THEATER starring DONALD O'CONNOR or JIMMY DURANTE on television . . . Saturday nights, NBC.

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Published for 81 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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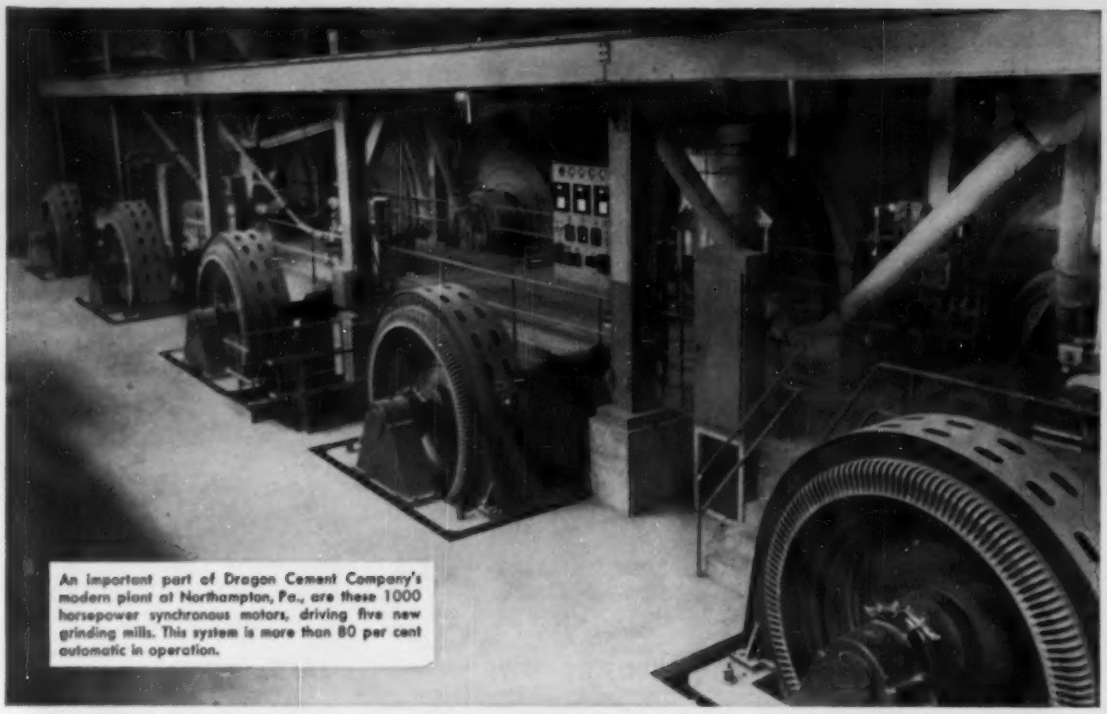


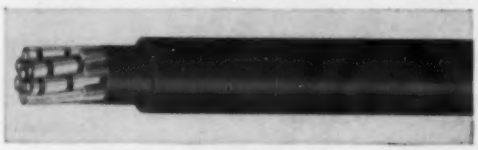
An important part of Dragon Cement Company's modern plant at Northampton, Pa., are these 1000 horsepower synchronous motors, driving five new grinding mills. This system is more than 80 per cent automatic in operation.

80% automatic, this plant specified OKOLITE-OKOPRENE cables

Since Dragon Cement Company's new mill was to represent the latest developments in cement making techniques, process control and automation were given the greatest consideration. This necessitated a reliable electrical power distribution system with dependable control circuits.

After thoroughly investigating the neoprene-jacketed wire field, they selected Okolite-Okoprene. In their new mill installation, 70 miles of cable were used for control circuits, and 25 miles for power distribution—all Okolite-Okoprene.

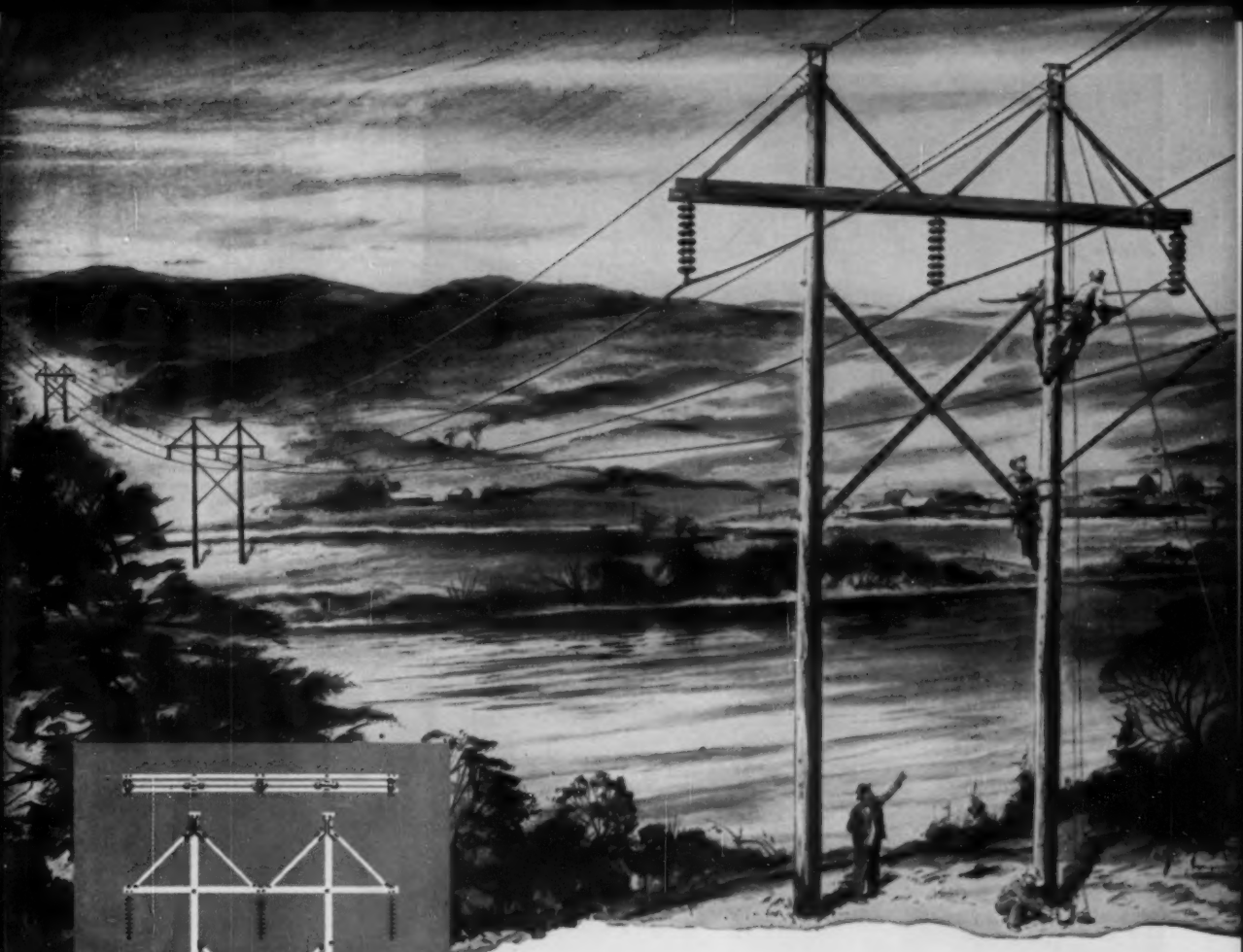
Dragon Cement Company is following a nation-wide trend of manufacturers to Okolite-Okoprene cables for circuits that must not fail. Okolite oil-base insulation, made from natural wild up-river Fine Para rubber, is moisture-, ozone-, and heat-resistant. The Okoprene sheath gives maximum protection from most harmful acids, oils and chemicals. In addition, because Okoprene's high surface resistivity prevents heavy longitudinal drainage currents, these cables are used in many

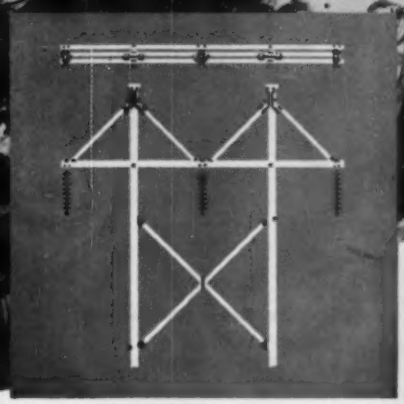


utility and industrial plants *unshielded* up to 5000 volts. When you order cable for circuits that must not fail, specify Okolite-Okoprene. Write for our new Bulletin **EW-1085** for full details. The Okonite Company, Passaic, N. J.

OKONITE SINCE 1878 ***insulated cables***

2967





Type No. 702 —
Tangent Structure with braces . . .
for voltages 69 to 154 KV*

LIST OF MATERIAL

Quantity	Description
2	Crossarm
3	Steel spacer w/mounting bolts
2	Stud bolt ⅞" w/washer nuts and locknuts
1	Bent stud bolt ⅞" x 8" w/2 sq. nuts
2	Bent bolt ⅞" x 5½" w/sq. nut
4	Vee Brace 3½" x 4⅛" cross section
1 set	Cross brace w/fittings, clamp, ⅞" pole bolts, curved washers
2	Static wire support
4	Machine bolt ¾" w/locknuts
2	Clevis
2	Suspension clamp for static wire
as req'd	Suspension insulators & fittings

How Graybar Methods and Manpower help Standard Construction Practice

You can read in the open country of America the story of our rapid growth in production capacity. New transmission lines, reaching out over plains, mountains and rivers foretell our multiplying strength in building for defense and for better living.

Standard construction practice in transmission line building has given new facility to this basic work. And through its network of offices and warehouses, Graybar contributes substantially to line building speed. Graybar's ability to deliver "packaged" crossarm assemblies for any line structure is a case in point. Fabricated and fitted with hardware to your specifications, the complete crossarm units can be delivered to the job at costs far less than those entailed in separate field handling. And, to complete the "package" Graybar Outside Construction Specialists are always on call to render technical help on out-of-the-ordinary problems. *Graybar Electric Company, Inc. Executive offices: Graybar Building, 420 Lexington Avenue, New York 17, N. Y.*

388-07

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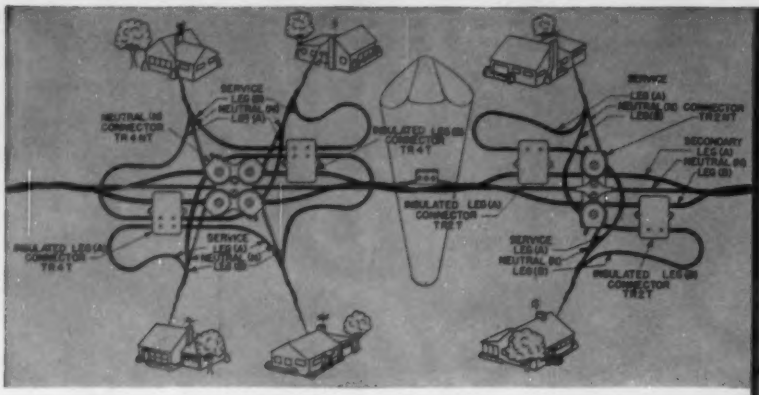
CHRYSLER Everything Electrical

IN OVER 110 PRINCIPAL CITIES



A complete 4 service TRIPL-X-TAP unit with type GTC connectors used as secondary feeder taps. †

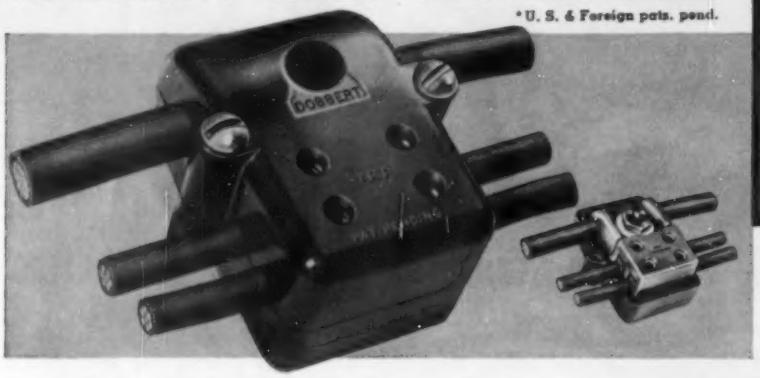
Dossert leads the industry again with the NEW

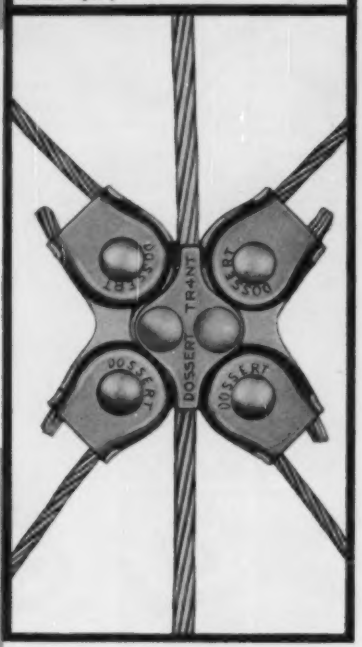
TRIPL-X-TAP*

3-UNIT CONNECTOR

FOR SELF-SUPPORTING SECONDARY AND SERVICE DROP CABLE

*U. S. & Foreign pats. pend.





NEUTRAL CONNECTOR

INSULATED CONNECTOR

Forget about hand-taping . . . about complicated residential hook-ups!

Dossert's new TRIPL-X-TAP 3-Unit Connector—for conductors of copper or aluminum or both—saves labor and installation costs . . . insures the most dependable connections possible.

TRIPL-X-TAP or its components can also be used on open wire systems.

Two Insulated Connectors plus a Neutral Connector comprise the compact, low cost TRIPL-X-TAP "package". No need to remove insulating cover for subsequent connects or disconnects. No secondary spool racks or costly extra hardware. TRIPL-X-TAP installations insure positive electrical joints and through use of supporting neutrals guarantee mechanical permanence. The insulated connector housing is made of high strength, high impact Bakelite composition, affording better insulation and protection.

†Courtesy of Long Island Lighting Co.

50 YEARS OF TECHNICAL KNOW-HOW

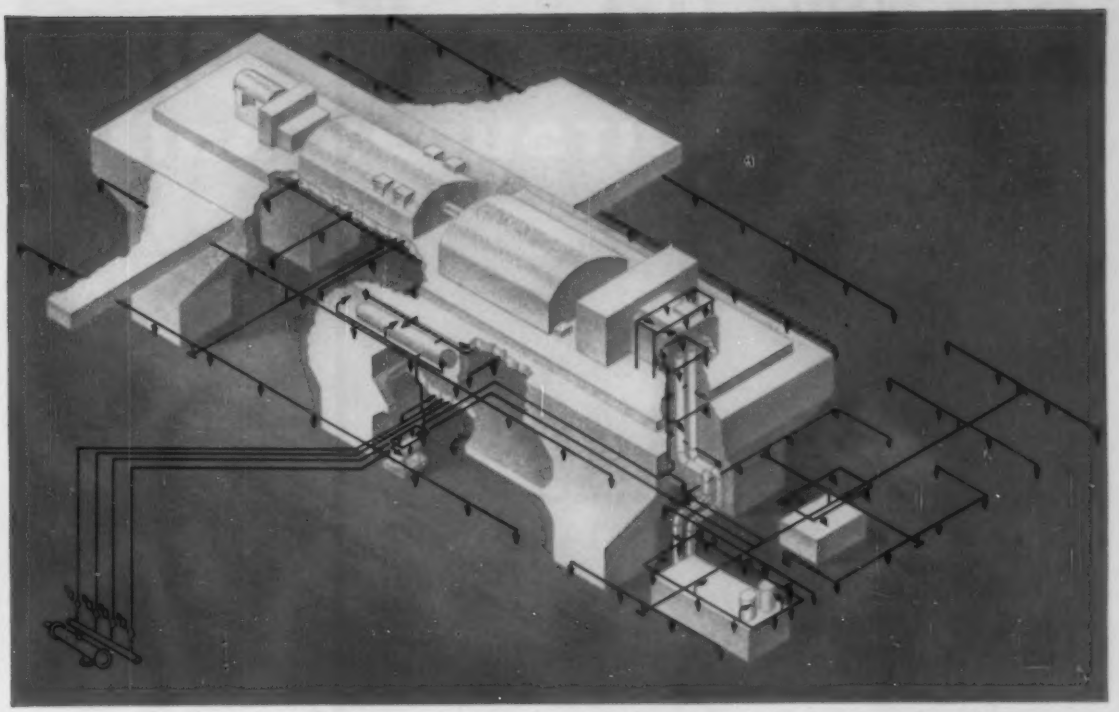
Write for details and prices today.

DOSSERT MANUFACTURING CORP.

249 Huron Street, Brooklyn 22, N. Y.

Since 1904

Complete Fire Protection for Turbine Oil Systems



Typical Turbine Oil Mulsifyre System, sectionalized and actuated either automatically or by remote manual control

The severity of turbine oil fires of recent years, and the heavy losses resulting from them, have proved the need for an efficient protection system throughout the *whole* area of hazard. One of the most practical extinguishing agents for putting out oil fires is water spray — and, one of the most effective methods of producing water spray is a Grinnell Mulsifyre System.

Grinnell Mulsifyre attacks oil fires in these different ways:

- By forming a fire-extinguishing blanket of emulsion on the surface of the oil.
- By introducing water vapor molecules between the oil vapor and oxygen molecules, to make the resulting mixture unburnable through "vapor dilution".
- By cooling oil at its surface, thus slowing down production of burnable vapor.
- By using up heat through flash evaporation of water, to keep oil vapor below the ignition point.

Grinnell manufactures and installs fire protection systems for every normal or special fire hazard — Grinnell Automatic Sprinkler Systems for standard risks; Grinnell Mulsifyre, ProtectoSpray, Multitrol Deluge, ProtectoFoam, C-O-Two, and dry chemical systems for special or extra-hazardous risks. Write for your free copy of "Occupancy Fire Record in Electric Generating Stations" and "Turbine Oil Fire Protection". Grinnell Company, Inc., Providence, R. I. Branch Offices in principal cities.

GRINNELL *Mulsifyre*

EMULSION EXTINGUISHMENT OF OIL FIRES

ANOTHER FARGO TIME SAVER

The WEDGE TYPE SERVICE DEAD END

FAST INSTALLATION . . . can be installed over continuous run saving time and conductor . . . easily released for sagging with screwdriver on most common sizes . . . exclusive Fargo reversible wedge fits shell two ways to eliminate twisting bail when installing . . . just loop flexible bail around support.

SIMPLE CONSTRUCTION . . . cast aluminum, reversible wedge with release holes provides ample bearing surface on conductor . . . stamped heavy aluminum shell with serrations grips securely without damaging neutral . . . wedge and shell are aluminum for "like metal" contact with neutral . . . plated grommet on long flexible bail eliminates sharp bends and bail bearing on itself when looped.

LONG FLEXIBLE PLATED BAIL . . . eliminates one line stress on insulator . . . multi-strand bail conforms to any size or shape insulator, hook or eye . . . easily looped . . . plated phosphor bronze bail minimizes danger of galvanic corrosion between bail and bare aluminum neutral when both are installed on the same spool.

MINIMUM INVENTORY . . . one size dead end for aluminum, ACSR or ACSW handles the range from #6 solid through #2 ACSR.

Ask your Line Material Field Engineer for complete details.

FARGO

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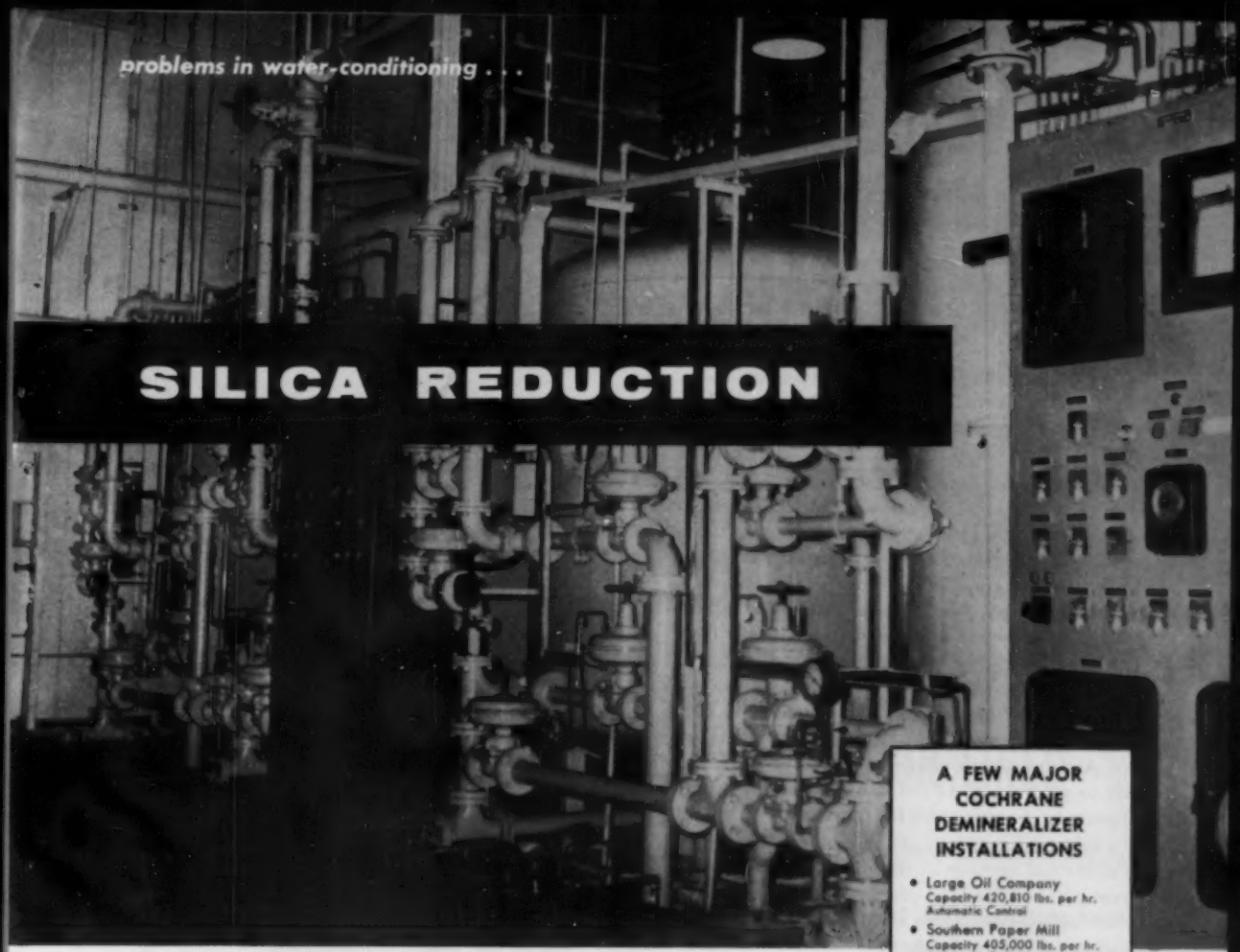
LM



A FEW MAJOR COCHRANE DEMINERALIZER INSTALLATIONS

- **Large Oil Company**
  Capacity 420,810 lbs. per hr.
  Automatic Control
- **Southern Paper Mill**
  Capacity 405,000 lbs. per hr.
  Automatic Control
- **Textile Manufacturer**
  Capacity 360,000 lbs. per hr.
  Automatic Control
- **Utility**
  Capacity 266,400 lbs. per hr.
  Automatic Control
- **Aluminum Producer**
  Capacity 387,000 lbs. per hr.
  Automatic Control
- **U.S. Government**
  Capacity 298,800 lbs. per hr.
  Automatic Control
- **Automobile Manufacturer**
  Capacity 182,268 lbs. per hr.
  Automatic Control
- **Pharmaceutical Company**
  Capacity 29,880 lbs. per hr.
  Automatic Control
- **Chemical Manufacturer**
  Capacity 15,000 lbs. per hr.
  Manual Control
- **Steamship Installation**
  Capacity 1,776 lbs. per hr.
  Manual Control

For your protection

buy **Cochrane's** *experience*

in demineralization

An impressive list of Cochrane 2-bed, 3-bed, 4-bed and mixed bed Demineralizer installations have been providing continuous protection for years in many outstanding high pressure power plants in public utility and industrial fields.

The illustration above is just one of many such installations. Designed for a large paper company, it produces an effluent with a silica content of as low as 0.02 ppm and total dissolved solids of as low as 0.4 ppm. Cation units are 6′ x 6′ and anion units 6′ x 8′ providing demineralized water supply of over 100,000 lbs. per hour for 1200 psi boilers.

Demineralized water quality is superlative. Cochrane's progress in solving the many problems associated with demineralization is the result of untiring research by their staff of chemists, engineers and research men. This background is your assurance of satisfactory operation. Why not take advantage of it? For the answer to your water conditioning problem . . . consult Cochrane first. Ask for Bulletin 5800-B.

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Cochrane
CORPORATION

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Demineralizers • Hot Process Softeners • Hot Zeolite Softeners • Dealkalizers • Reactors • Deaerators • Continuous Blowoff Systems • Condensate Return Systems • Specialties

G.E. DEVELOPS NEW PLUG-IN CHASSIS FOR 2-WAY RADIO

NEW PROGRESS LINE saves money on maintenance through faster servicing—protects from obsolescence because chassis are quickly interchangeable.

IN the new Progress Line, transmitter, receiver, power supply and optional chassis are individually rack-mounted in a triple-rigid mobile case. Rapid interchangeability is provided by this rack construction and true plug-in chassis. This plug-in design permits changes in frequency, power, type of reception (narrow or wide band) quickly *at minimum cost, at any time.* You're free of any obsolescence risk!

You may switch Progress Line mobile units—whether front or trunk mount, between vehicles with 6 or 12 volt DC systems. No electrical alterations are needed. And any mobile combination can be converted quickly to a low-cost, 117 volt AC intermittent duty base station by changing only the power supply chassis!

Let a G-E Communications Counselor analyze your radio needs and develop an installation or conversion program planned for long-run savings. Write or call today for full specifications on the new PROGRESS LINE. *General Electric Company, Communication Equipment, Section X1975-25, Electronics Park, Syracuse, N. Y.*

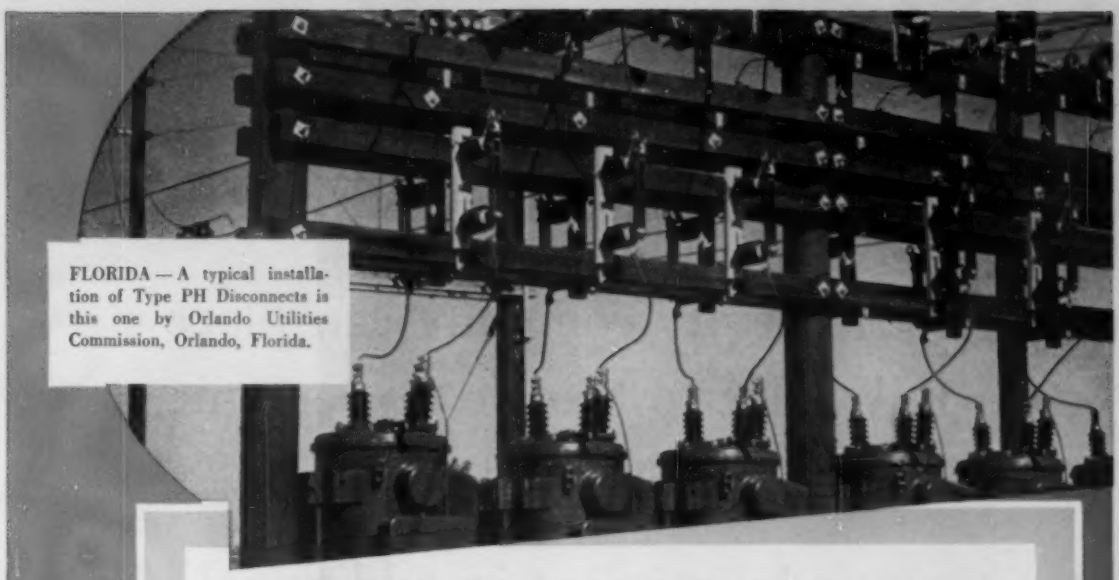
INDIVIDUAL PLUG-IN CHASSIS minimize capital investment in spares and reduce radio maintenance time! Your vehicles will be back "in service" faster. For instance, you can replace either a transmitter or receiver plug-in chassis right in the vehicle in 5 minutes—using only a screwdriver. Individual plug-in chassis of the new General Electric Progress Line units also provide complete interchangeability between mobile and station transmitters and receivers.

◀ There is a G-E Authorized Service Station near you. Look for this sign.

EASY FRONT MOUNTING under the dash. The new G-E Progress Line case is less than 15" deep. For the first time you can have a 90-watt front mount mobile unit in the 25-54 MC band and a 50-watt front mount mobile unit in the 144-174 MC band. In the 25-54 MC band you can now have simultaneous monitoring of 2 channels, in the same case, without additional equipment.

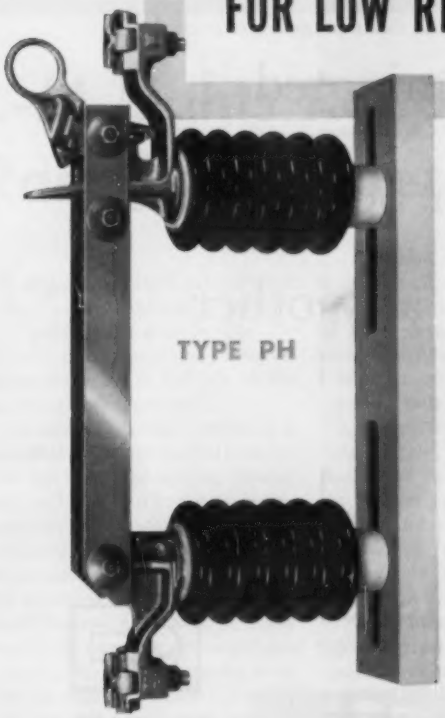
Progress Is Our Most Important Product

GENERAL ELECTRIC



FLORIDA — A typical installation of Type PH Disconnects is this one by Orlando Utilities Commission, Orlando, Florida.

A LOW-COST, HIGH-QUALITY DISCONNECT FOR LOW REVENUE DISTRIBUTION LINES



SOUTHERN STATES TYPE PH HAS MANY DESIGN EXTRAS

It is often difficult to justify expensive switches for isolating, by-passing, or disconnecting on low revenue distribution lines. Yet the mechanical features of such disconnects are highly desirable, as any operating man knows.

That is why Southern States designed its popular, low-priced Type PH Disconnect. Its cost is easily justified, and yet it has many design extras found on more expensive switching equipment. For instance:

- **High-pressure line contacts**
- **Integral terminals**
- **Rugged parallel blade construction**
- **Blade pry-out action**
- **Positive blade latching**

This single throw, single pole, hookstick-operated switch designed for wood crossarm mounting, is answering the requirements for many utilities throughout the nation. You will find it profitable too. For full details, write for Bulletin 54 PH.

CHANNEL OR ROLLED FLANGE STEEL BASES ARE AVAILABLE.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

At less cost than a dozen miles of new high-line,

any electric utility company can place a 1,000 KW. Electro-Mobile Power unit right at the point of need.

It postpones investment in additional generating station capacity.

Transmission line loss is eliminated.

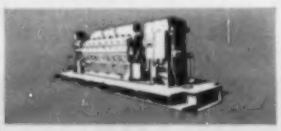
Complete self-operation can be provided.

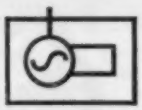
The unit may be moved to any other site quickly and cheaply.

Write for simple formula explaining investment advantages of Electro-Mobile Power:

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS • LA GRANGE, ILLINOIS





Rail car, truck trailer and portable units—350 to 1,000 KW.

Sold and serviced directly through a manufacturer's organization. Electro-Motive Division offices located in: New York City, Chicago, Jacksonville, St. Louis and San Francisco. *In Canada:* GENERAL MOTORS DIESEL, LTD., London, Ontario

ROADWAYS AND PARKING AREAS are lighted with L-M Spherolites® with mercury vapor lamps.

L-M Lights Roadways, Runways, and Ramps at General Mitchell Field

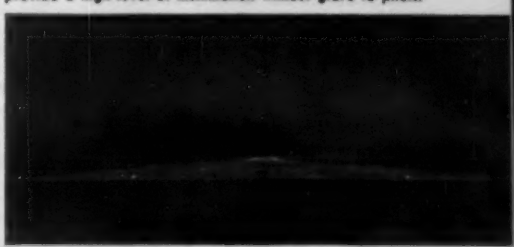
Milwaukee County's magnificent new air terminal at General Mitchell Field provides the latest facilities for comfort, convenience, and service of passengers flying in and out of the big midwestern metropolis.

The newly dedicated terminal is a beautiful low modern building nearly 1000 feet long. The arriving traveler finds such modern conveniences as automatic doors, escalators, the latest in lighting, a wide range of facilities for his comfort and convenience. The new airport is not only a great focal point for Milwaukee County but also a model for airline terminals everywhere.

Approach roadways and the huge 2000-car parking area are lighted by L-M mercury vapor units on steel poles. Loading ramps are illuminated by L-M's latest fluorescent luminaires, whose broad light sources provide ample illumination with a minimum of glare to incoming pilots. Runways for planes are marked with L-M's high intensity Thermal Beam™ runway lighting units.

L-M provides a complete line of incandescent, mercury vapor, and fluorescent lighting and equipment for outdoor installations—for street lighting, airports, roadways, shopping centers, parking areas. L-M's runway lights are the culmination of years of development by the leader in airport runway lighting. For complete information on L-M products and services, ask the L-M Field Engineer or Lighting Engineer; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

RAMP LIGHTING — 154 of L-M's new fluorescent units provide a high level of illumination without glare to pilots.



RUNWAY LIGHTS — L-M's Thermal Beam units compensate in both intensity and direction for fog and other low-visibility conditions, by toeing in as intensity is stepped up, toeing out as intensity is lowered in clear weather. Smaller L-M lights light taxiways.

LM

LINE MATERIAL

Street and Airport Lighting

The lamp and socket swing down as part of the glassware assembly, become automatically de-energized for quick, Service-Safe re-lamping during circuit operation.

The refractor assembly swings wide open on the house side, for easy re-lamping. Refractor assembly can be removed easily but not accidentally.

Make-before-break action of contacts . . .

L-M's New Series Ovalite is Automatically De-Energized with New Service-Safe Feature

Both lamp and socket are automatically de-energized and isolated from series circuit when glassware swings down. Make-before-break action of contacts in series luminaire eliminates arcing.

By **DEAN W. MORRILL**, Lighting Application Engineer, Line Material Company

L-M's new mercury vapor Ovalite offers outstanding design features for safe, economical servicing of the luminaire, in addition to its efficient light distribution.

The lamp and socket swing down as part of the glassware assembly; as the socket leaves the receptacle, it becomes automatically de-energized, and much more accessible for quick, safe re-lamping of the luminaire during circuit operation, saving service time.

Contacts on the series Ovalite are so designed that there is a make-before-break action, which means the lamp connections are shunted before they are disconnected. In restoring the connection the same principle applies. The lamp connection is made before the shunt is opened, eliminating arcing.

The contacts are silver-plated beryllium copper; socket is steatite; receptacle is wet-process glazed porcelain with a 5,000-volt insulation rating which meets EEI-NEMA specification of 19,000 volts withstand.

This new Ovalite provides a choice of horizontal or pendant mounting for mercury vapor; choice of types III or IV light-distribution patterns.

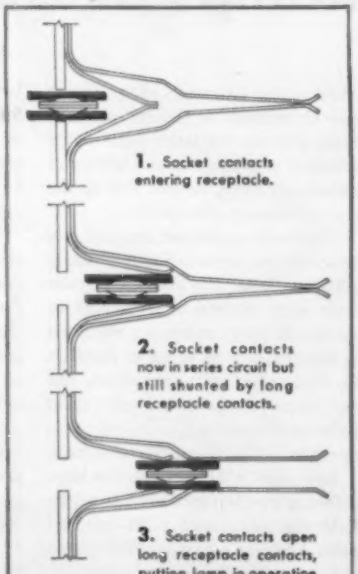
The Service-Safe feature of L-M's Ovalite is available in both multiple and series luminaires.

Get Complete Information

This series luminaire is specifically designed for the Uni-Ballast system. Ask the L-M Field Engineer or Lighting Engineer for information on the new L-M Ovalite; on Uni-Ballast, the most economical system for mercury vapor lighting; and on L-M's Lighting Recommendation Service. Or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

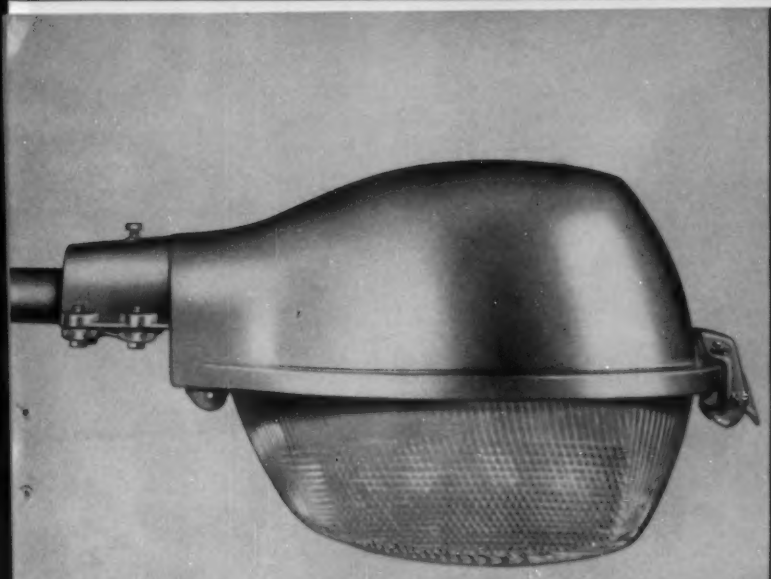
"Ovalite," "Uni-Ballast" and "Service-Safe" are Line Material Company trademarks.

211


1. Socket contacts entering receptacle.
2. Socket contacts now in series circuit but still shunted by long receptacle contacts.
3. Socket contacts open long receptacle contacts, putting lamp in operation in series circuit.

NOTE—Procedure is reversed when socket is withdrawn during luminaire opening. Lamp is shunted before being withdrawn from circuit. This make-before-break action eliminates arcing.

LINE MATERIAL
Street Lighting



L-M's new mercury vapor Ovalite has high co-efficient of utilization on the street side, with a choice of types III or IV asymmetric light distribution merely by changing glassware.

Lamp and socket swing down, become automatically de-energized for quick, Service-Safe re-lamping during circuit operation.

Wiping-action contacts open circuit on multiple unit . . .

Now Quick Re-Lamping Possible with Ovalite's Automatic De-Energizing Feature

New Service-Safe design automatically isolates lamp and socket from circuit. As luminaire is closed, circuit is completed by means of wiping-action silver-plated beryllium copper contacts.

By **STACY STANDLEY**
Manager of Lighting Sales
Line Material Company

Here's a new feature in luminaire design that offers savings in servicing. L-M's Ovalite lamp and socket are automatically de-energized and isolated to provide quick, safe re-lamping of the luminaire during circuit operation.

The lamp and socket are part of the refractor assembly. On this multiple unit, wiping-action contacts open as the assembly is swung down, isolating the lamp and socket from the circuit and providing easy, safe access to the luminaire. The wiping action keeps the contacts clean.

The Service-Safe feature is also available on L-M's series Ovalite. This series Ovalite has a shunting make-before-break action.

Other Outstanding Features of L-M's Ovalite

Choice of type III or IV light-distribution pattern by simply changing the glassware.

High co-efficient of utilization on street side.

Latch automatically assures positive closing of luminaire when refractor is pushed up.

Both latch and hinge have a spring action to hold the refractor firmly against the gasket, assuring a bugproof, dustproof, and weatherproof seal.

Complete refractor assembly can be removed easily when desired, cannot be accidentally unhooked.

Hood is a smoothly finished one-piece aluminum casting.

One-piece aluminum reflector.

All hardware is stainless steel or non-ferrous metal.

No trapped light at the glassware junction.

Reflector and refractor are easily cleaned.

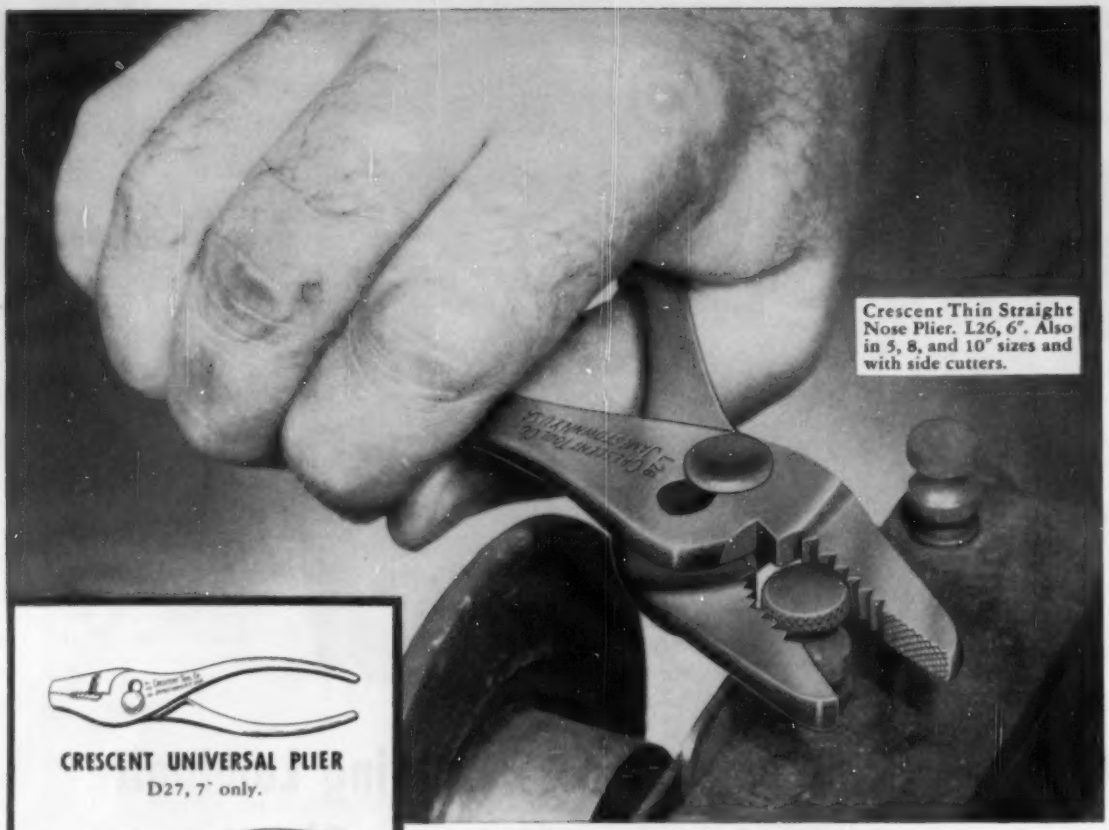
Get Complete Information

Ask the L-M Field Engineer or Lighting Engineer for information on the new L-M Ovalite, and on L-M's Lighting Recommendation Service. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division.)

"Ovalite" and "Service-Safe" are Line Material Company trademarks.

212

LINE MATERIAL *Street Lighting*



Crescent Thin Straight Nose Plier. L26, 6". Also in 5, 8, and 10" sizes and with side cutters.

CRESCENT UNIVERSAL PLIER
D27, 7" only.

MoToR KiT COMBINATION PLIER
G25, 5". Also in 6, 8, and 10" sizes.

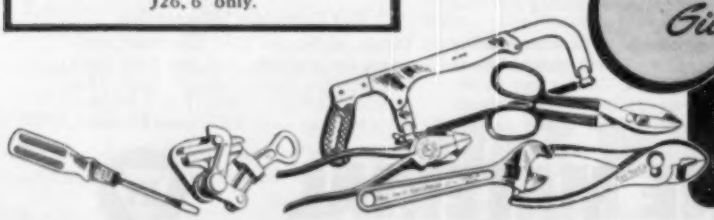
CeeTeeCo COMBINATION PLIER
H25, 5". Also in 6, 8, and 10" sizes.

CRESCENT THIN BENT NOSE PLIER
J26, 6" only.

CRESCENT
SLIP JOINT PLIERS

Crescent offers a wide selection of styles and sizes in this widely used plier type. All are drop-forged from special analysis steel and finished in bright plate. They have sharply milled teeth, comfortable handles and smooth working joints. The joint bolt and nut are turned from solid bar steel and case hardened. Sold by Industrial Distributors and Hardware Dealers everywhere.

CRESCENT TOOLS
Give Wings to Work
®
Sign of the Artisan
Symbol of Excellence



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

COMPARE

this dial switch

with any other

See why you get long operating life

This photo shows the rugged construction features of the dial switch from a *Quick-Break* mechanism of an Allis-Chalmers distribution regulator. See the extras: wired boltheads, oversize contacts, and extra-heavy backup springs on the moving contacts that make contact pressure so strong you can't pull contacts apart.

Moreover, the *Quick-Break* mechanism is simple. Its small number of parts make it easy to assemble and align. As a result, mechanical strength and reliability are at a maximum. Yet you get more extras — like *two* main drive springs—one for driving . . . one for snubbing.

This tap-changing mechanism is the heart of every Allis-Chalmers voltage regulator. Its record speaks for its outstanding reliability. More than twenty years of successful, unexcelled operation on thousands of regulator and load tap-changing transformers. One unit withstood more than five million tap changes during exhaustive laboratory tests.

Get the most for your regulation dollar. Facts on this and other quality features of Allis-Chalmers voltage regulators are available by calling your nearby Allis-Chalmers district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4736

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

ORIGINATORS OF 5/8% STEP REGULATION

IN ASA STANDARD RATINGS

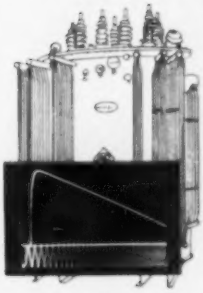
Here's News on

A-C ALLIS CHALMERS

ALLIS-

Power Transformers

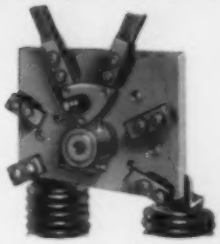
LOWER AND LIGHTER TRANSFORMERS are the result of new Allis-Chalmers designs. Installation is easier, transfer to new location simpler because higher rated units can now meet existing weight and height limitations. New shielding, improved insulation coordination, and use of cold-rolled oriented core steels have resulted in reduction of as much as 30 inches in overall height, reduction of as much as 25% of previous weights. Improved heat transfer increases overload capabilities.



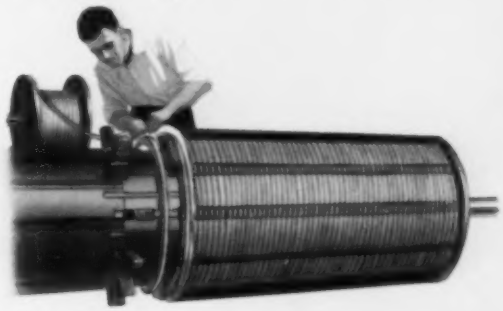
FULL WAVE IMPULSE TESTS of 100% Basic Impulse Level are now being made on most Allis-Chalmers power transformers. Results of this test program have helped make possible Allis-Chalmers corona-free design. Actual test values show that BIL and dielectric strength have been increased, resulting in additional margin of safety.

HV BUSHING REPLACEMENT SIMPLIFIED. New ASA standard HV bushings — 23 through 69 kv — are now being shipped. All bushings have standard mounting dimensions and standard shank lengths below flange, which makes interchange easy. Provision for power factor testing is available.

NEW POSITIVE SEAL LV BUSHINGS rated 8.7 and 15 kv offer advantages in installation, replacement, and stocking. Bushings can be replaced externally without removing transformer manhole cover. Gaskets under controlled compression eliminate all cemented parts. Original hardware can be re-used when replacing damaged porcelain. High degree of interchangeability is possible: the same porcelain is used on all current ratings; the same hardware used on both voltage classes.



DEPENDABLE TAP CHANGING provided by service-proved "point contact" mechanism. Excellent contact is assured by thorough wiping action. Combination of mechanical and magnetic pressures develops maximum contact pressure. Like all accessories, tap-changing mechanism is located for maximum convenience. Panels are vertically mounted on top of core and coil assembly to permit easy inspection and adjustment without untanking.



INCREASED MECHANICAL STRENGTH IN COILS results from no-splice, continuous disk winding. Turns are wound on pre-formed tubes with carefully controlled tension to insure a tight coil. Coils are magnetically balanced to prevent high short-circuit stresses. To assure proper coil ventilation, each conductor is exposed to cooling oil. Special snap-lock spacers, keyed in place between coils, form uniform cooling ducts. Particular attention is paid to lining up spacers to obtain maximum coil rigidity.

NEW WELDED-ON SWAGED TUBE RADIATORS provide effective cooling. They eliminate handling radiators and oil as separate shipping items, simplify installation and maintenance. Radiator tubes are shaped to minimize vibration and contribute to a quiet transformer — another result of Allis-Chalmers extensive sound research program.

CHALMERS

FOR MORE INFORMATION
see your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin, for new catalog on "Preferred Power Transformers," 2842.

A-4734

Pneu-Draulic Operators Prove Dependability ...Low Maintenance

The *Pneu-Draulic* operator is in use on Allis-Chalmers breakers in many parts of the country. Its planned simplicity and reliability have led to quick and widespread acceptance.

Here are a few advantages of this operating mechanism:

★ **Dust** eliminated by virtual sealing of system.

★ **Corrosion** eliminated because oil in the system contains one of the best corrosion inhibitors known.

★ **Moisture** problems eliminated, since the system is filled with oil.

Get complete information on the *Pneu-Draulic* operator and the Allis-Chalmers breaker. Call your nearby A-C office, or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 71B7942.

A-4524

Pneu-Draulic is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Utilities can depend on equipment containing C-D-F Insulating Parts

The reliable operation and long life of heavy electrical equipment often depends on insulating parts. A good supplier of insulation draws from past experience to make this possible—C-D-F has been a recognized industry leader since 1895! A good supplier expands his research and technical skill consistently—C-D-F offers the *widest range of electrical insulating materials*, from Vulcanized Fibre to C-D-F Products of Teflon.*

A BIG, RELIABLE SOURCE OF SUPPLY

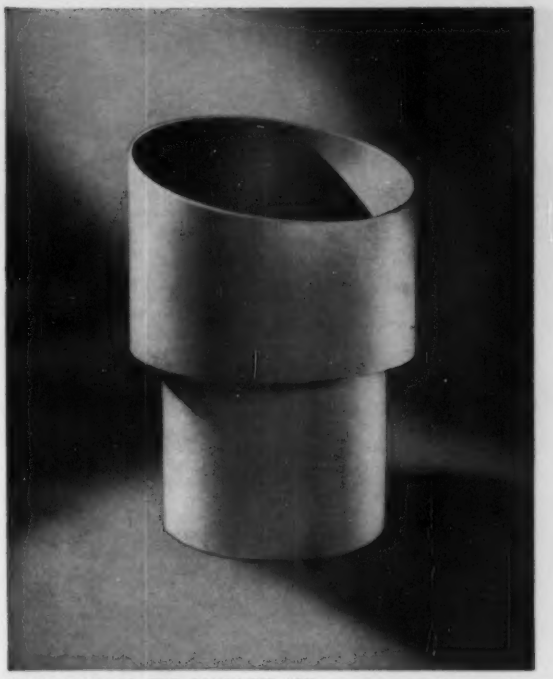
As a buyer of Utility Electrical Equipment, you gain when your manufacturers work with C-D-F. Quality and dependability of electrical insulation, at reasonable cost, are guaranteed. The latest technical advances and ideas can flow freely between you and C-D-F's engineers. This page shows only a few of the many products C-D-F makes and fabricates for the electrical industry. Consult Sweet's Design File for catalog information, or call your C-D-F sales engineer (sales offices in principal cities)—you'll find he's a good man to know!

*DuPont Trademark

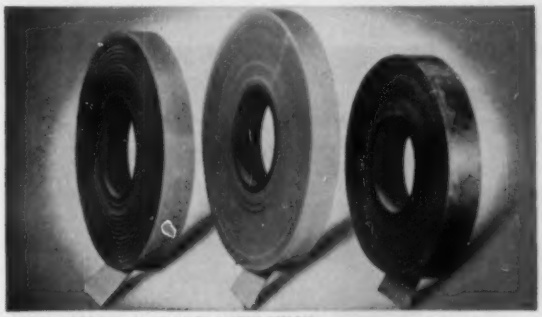
Continental-Diamond Fibre

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

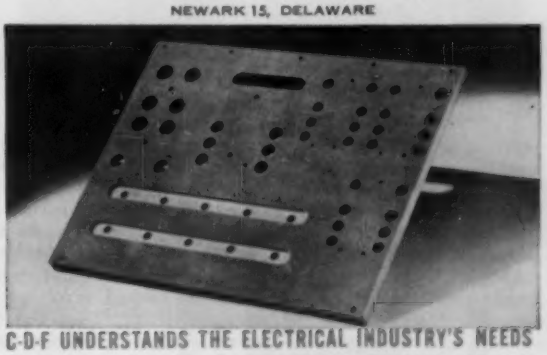
NEWARK 15, DELAWARE



C-D-F HANDLES THE COMPLETE JOB An oil circuit breaker component is made from two Dilecto laminated plastic tubes, with a threaded ring joining the assembly. From raw materials to finish machining C-D-F does it all!

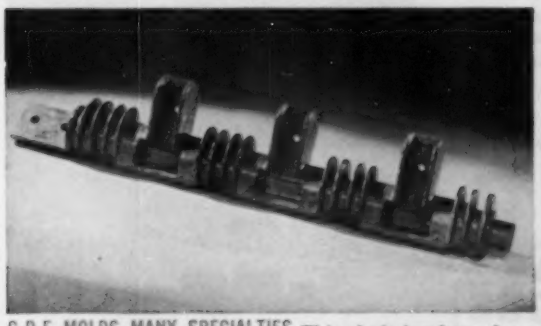


C-D-F MAKES FLEXIBLE INSULATION To meet critical high heat and electrical insulating needs, C-D-F makes these efficient, easy-to-apply tapes. Size range is wide, with latest resins and backing materials used. Write for samples and technical bulletins of Silicone, Teflon, and Micabond tapes.



C-D-F UNDERSTANDS THE ELECTRICAL INDUSTRY'S NEEDS

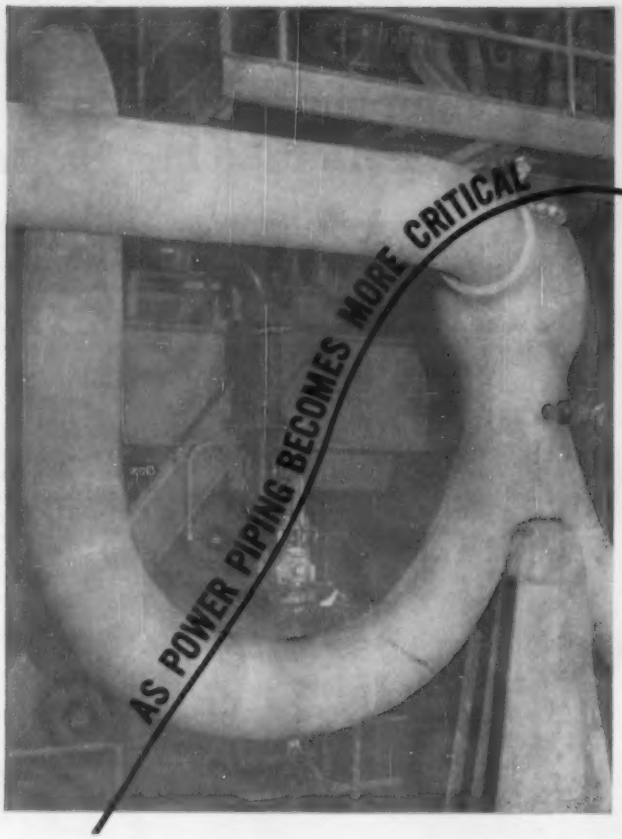
Precisely machined to close tolerances, Dilecto panel boards guarantee dependable insulation, help designers save space. New 1955 Dilecto catalog is yours for the asking, lists all new grades.



C-D-F MOLDS MANY SPECIALTIES This shaft insulator for a circuit breaker is molded from C-D-F's cloth-based industrial thermosetting plastic, Celoron. Note complexity of mold, clean detailing. Celoron has high impact strength, is used in switchgear.

C-D-F GIVES YOU BETTER MOTOR AND GENERATOR INSULATION

All these built-up and bonded mica products are made by C-D-F to provide uniform high-heat resistance and dielectric strength. All forms of Micabond are made for better performance and lower costs.



M. W. KELLOGG FLEXIBILITY ANALYSIS TECHNIQUES KEEP PACE

Increasingly high pressures and temperatures in central power stations call for increasingly accurate determination of the stresses and reactions of main and reheat piping. Thorough flexibility analysis eliminates the necessity of providing an excessive safety factor by overdesigning. This means shorter pipe runs—which decrease capital investment and increase operating efficiency.

M. W. Kellogg's special stress analysis group employs two basic techniques: (1) The general analytical method, involving development and solution of the requisite simultaneous equations for determining forces and moments in the piping system—calculated either manually or by an electronic computer; and (2) the unique Kellogg Piping Model Tester—which accurately simulates the operation of the most intricate piping systems under temperature.

The stress analysis group, originally formed in 1932, has become an integral function for many of M. W. Kellogg's power piping customers. The group is also available on a consulting basis. A recent booklet describes in detail Kellogg's various techniques for piping flexibility analysis. Copies are available on request.

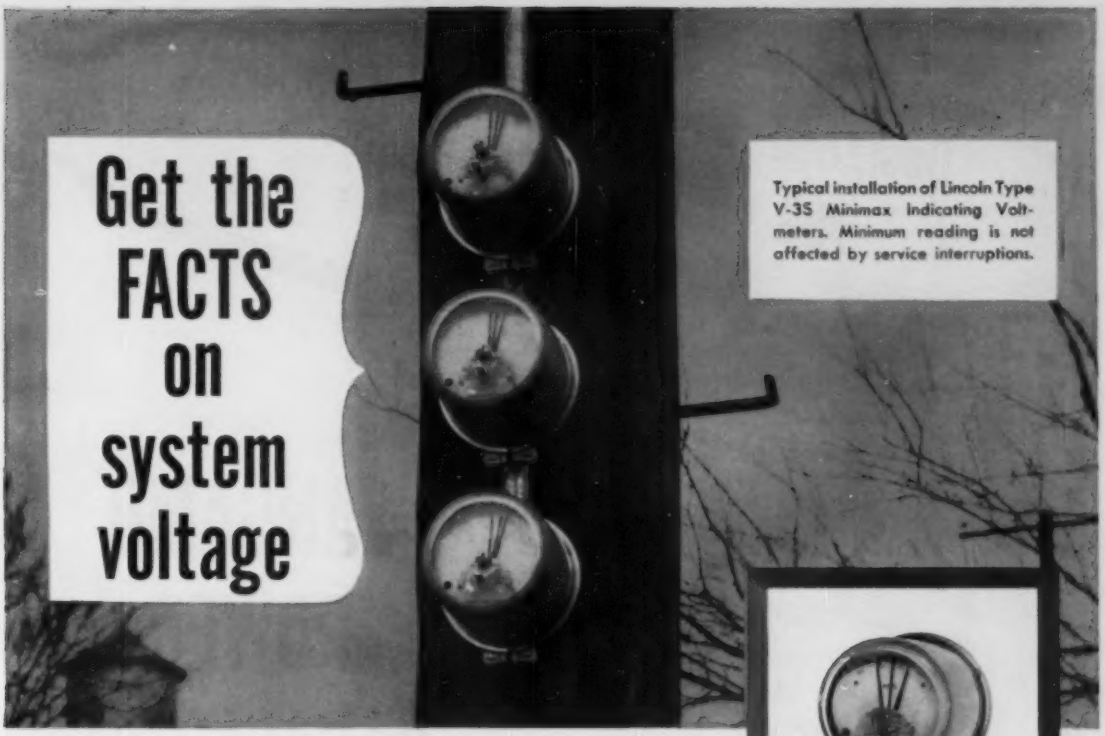
1. GENERAL ANALYTICAL SOLUTION—MANUALLY OR BY ELECTRONIC COMPUTER

2. THE UNIQUE KELLOGG PIPING MODEL TESTER

FABRICATED PRODUCTS DIVISION
THE M. W. KELLOGG COMPANY, 225 BROADWAY, NEW YORK 7, N. Y.
The Canadian Kellogg Company, Ltd., Toronto • Kellogg International Corporation, London
SUBSIDIARIES OF PULLMAN INCORPORATED

POWER PIPING—THE VITAL LINK

Get the FACTS on system voltage



Typical installation of Lincoln Type V-3S Minimax Indicating Voltmeters. Minimum reading is not affected by service interruptions.

Eliminate costly "surveys" with low-cost permanent installations of rugged LINCOLN THERMAL VOLTMETERS

Continuous knowledge of voltage at check points throughout your system lets you plan necessary changes to provide good customer service *before* difficulties develop.

Lincoln Thermal Voltmeters are an *economical* means of obtaining such knowledge—at substations—on distribution feeders—on secondaries—and even at the customer's premises. These rugged thermal voltmeters give continuous voltage data at low cost. Readings are not distorted by flicker voltage.

The line includes minimum-maximum indicating voltmeters and graphic voltmeters. It also includes an indicating voltmeter combined with a watthour meter in a single case. This combination can replace a conventional socket type watthour meter providing kwh for customer billing and exact knowledge of voltage at the service entrance. Write for complete information on the Lincoln line today.

Type V-2S Indicating Voltmeter, Used where loss of minimum voltage indication because of service interruptions is not a problem.

Graphic Voltmeter. Used where knowledge of time and duration of voltage changes is required.

Type J2WVS Combination kwhr — voltmeter. For continuous knowledge of voltage at service entrance, as well as kwh metering for customer billing.

SANGAMO — *Only Measured Facts are Known Facts*

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

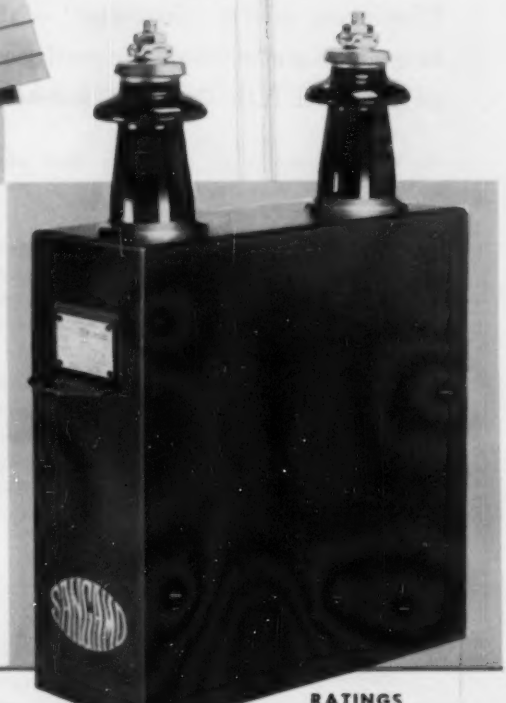
SH 55-2

Designed and built to specifications you might have written . . .

Power Capacitor Specifications

1. Corrosion protection – even though case finish is scratched. *
2. Solder-sealed porcelain bushings.
3. Reliable performance at low ambient temperature.
4. Suitable for vertical or horizontal mounting.
5. Low losses.
6. Low temperature rise.
7. Stability under all operating conditions.
8. Terminal connectors for either copper or aluminum.

SANGAMO POWER CAPACITORS



* After many talks with utility company men, we know you want your capacitor in a case having corrosion resistance that's more than just skin deep. Sangamo Diaclor Power Capacitors have a case which is metalized with pure aluminum and finished with a two-coat, baked, vinyl resin base paint. Rust and corrosion won't attack this case even if the finish is scratched through to the steel. That's because the aluminum will "sacrifice" itself before rusting occurs.

For more details on other features of the new Sangamo Diaclor Capacitor, write today for Bulletin 1120.

RATINGS

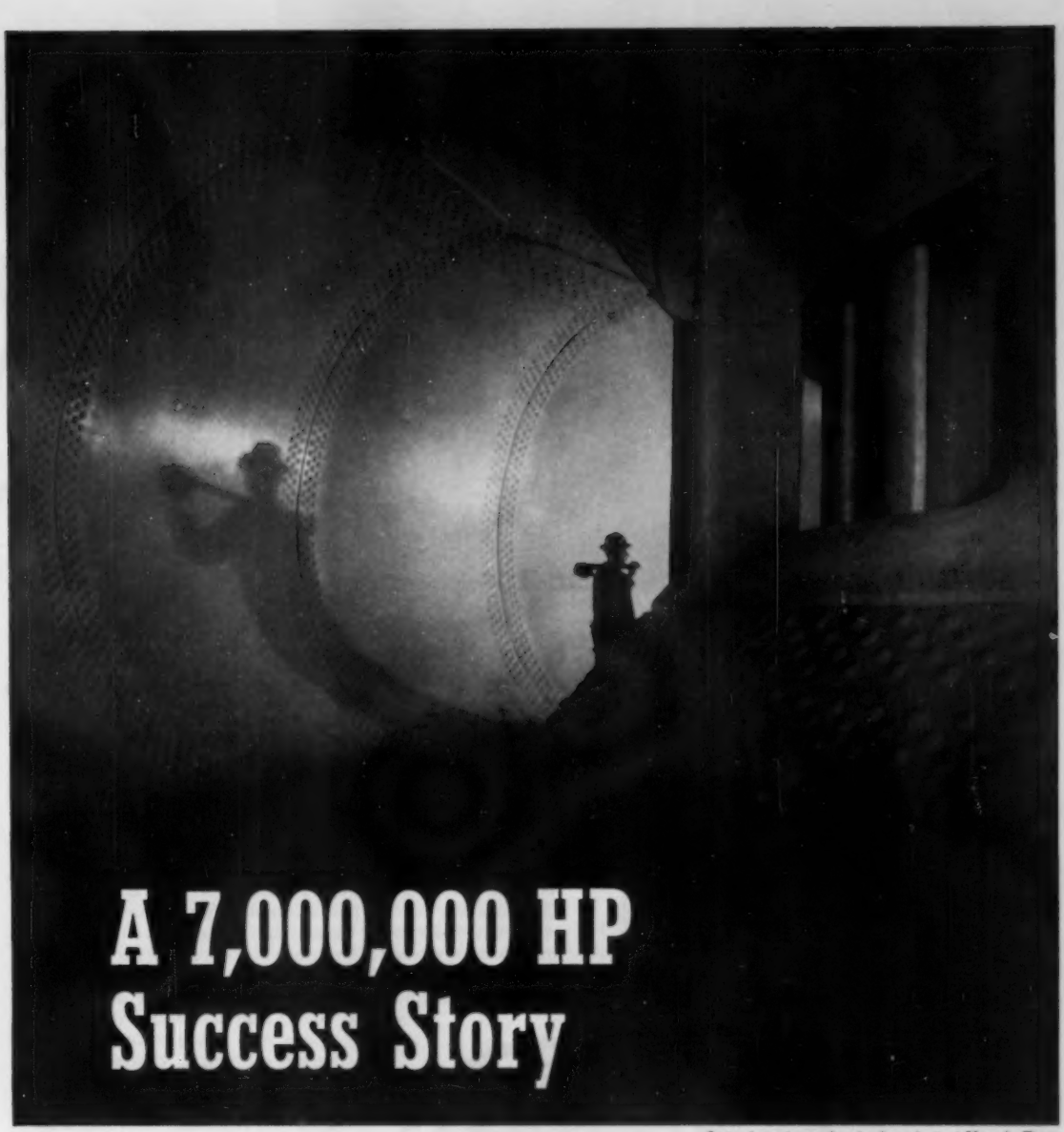
2400 Volts . . . . . 25 KVAR
7200 Volts . . . . . 25 KVAR
Singlephase . . . . . 60 Cycles

SANGAMO

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

PC55-3



A 7,000,000 HP Success Story

Interior view of spiral casing at Norris Dam

Achievements of Newport News personnel in designing and building water power equipment during the past thirty years reflect a high integration of skill and production facilities.

Answering demands for hydraulic turbines rated as high as 165,000 horsepower and as low as 500 horsepower, this trained organization has successfully filled contracts with an aggregate rated output in excess of 7,000,000 horsepower.

Other essential equipment including penstocks, spiral casings, valves, pumps, gates and rack rakes are also designed and built by Newport News.

An illustrated copy of our booklet entitled, "WATER POWER EQUIPMENT," will be sent to you upon request.

NEWPORT NEWS **SHIPBUILDING AND DRY DOCK COMPANY**
Newport News, Virginia

TAPE IT for durability with

USKORONA

the only tape that resists both moisture and ozone

Uskorona tape will *not* break down. Just how rugged is this tape? Well, in a corona-(ozone) resistance test of 4 leading brands, Uskorona was the only tape still intact after 4 hours of exposure. All others broke down. Even after 1500 additional and *consecutive* hours of exposure, Uskorona remained as fresh and corona-resistant as at the start.

Electrical engineers insist on Uskorona in the design, installation, operation and maintenance of power lines wherever corona or moisture is a problem. Uskorona provides ideal insulation in splicing electrical cables on underground power lines, on secondary network systems, underground street lighting circuits, and transformer leads. It fuses with and becomes a part of the insulation and gives the *same* dielectric strength as the original insulation. Exceeds A. S. T. M. specifications.

Uskorona® is obtainable at any of our selected distributors or any of the 27 "U. S." District Sales Offices. Or write address below.

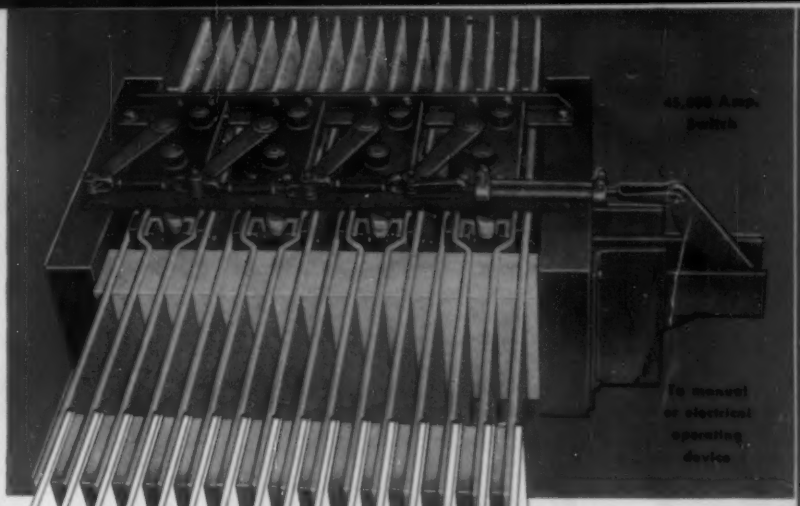
"U. S." Research perfects it..."U. S." Production builds it...U. S. Industry depends on it.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

HIGH CURRENT AC SWITCHING on R&IE INTERLEAVED BUS



Space Saving, In Line Mounted HIGH CURRENT SWITCHES

HIGH CURRENT, TYPE CR SWITCHES, mounted in-line with interleaved bus provide many design and operating advantages—

1. Save at least 60% space over conventional type disconnecting switches.
2. Can be mounted in-line with bus which is interleaved to reduce reactance.
3. Can be built, in single frame, for currents up to 60,000 amperes.

Operating advantages—

1. Operation at floor level regardless of elevation of switch.
2. Operating effort greatly reduced from that required of conventional blade switch of equal rating.
3. All contacts operate simultaneously with one continuous motion of operating handle.
4. Switch can be key interlocked with power source to prevent operation under load.

Send for descriptive bulletin No. 1220C.

Consult the R&IE Division at Greensburg for planning, detailing and fabricating your AC, or DC bus.

R&IE EQUIPMENT DIVISION I-T-E CIRCUIT BREAKER CO. GREENSBURG, PA.

INDOOR BUS SUPPORTS and BUS FABRICATION ● OUTDOOR BUS SUPPORTS and AIR SWITCHES ● SUBSTATION STRUCTURES—steel or aluminum ● TESTING DEVICES ● KIRK KEY INTERLOCK SYSTEMS ● ISOLATED PHASE BUS STRUCTURES ● INTERRUPTER SWITCHES

Mr. James Lohr, Plant Superintendent (right), and Standard lubrication specialist, John Pirtle, inspect new 68,000 kw. generator. Initial fill of 3,905 gallons of NONPAREIL Turbine Oil was made on start-up date, December 7, 1953. A graduate engineer from Rose Polytechnic Institute, John has also completed Standard's Sales Engineering School. Customers of John's find his background and experience pay off for them.

Peak loads call for peak performance

Indianapolis Power & Light Uses NONPAREIL TURBINE OIL

Five turbines now operating at Indianapolis Power & Light Company's White River generating plant provide the bulk of the utility's more than two billion Kwh. annual production. The units have been using Standard's NONPAREIL Turbine Oil since their start-up dates. James Lohr, Plant Superintendent of the White River Plant gives these reasons why he likes NONPAREIL as the lubricant:

(1) NONPAREIL Turbine Oil is guaranteed for the life of the turbine.

(2) Periodic examination of the oil by Standard Oil laboratories for maintenance of quality.

(3) Using NONPAREIL means turbines are serviced with highest quality lubricant.

(4) NONPAREIL Turbine Oil has always done an excellent job.

NONPAREIL Turbine Oil is used in more than 800 turbines in the midwest—some for more than 25 years. While Indianapolis Power & Light Company's daily output is now about 7 million Kwh., generators have never been shut down because of lubrication failure. Neutralization number of NONPAREIL in the utility's generators is guaranteed never to exceed 0.15 mg. KOH/g. Regular analysis by Standard Oil laboratory assures acidity will be kept far below that, usually 0.03.

You may wish to know more about NONPAREIL Turbine Oil. In the midwest your nearby Standard Oil lubrication specialist will be happy to provide it. Or contact—Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY
(Indiana)

STANDARD

And Now...

RCA Announces the FIRST Low-Cost

Packaged Microwave

with Voice Channels

PROVED throughout the nation and the world, RCA 960 megacycle Microwave is now available in a low-cost "package" unit, MM-9, as a complete station.

Important savings include:

- **Minimum real estate requirements**
- **No tower construction**
- **Easy economical installation**
- **Minimum maintenance**
- **Unattended reliable operation**

When mounted on inexpensive supports, such as wooden poles, up to 100 feet high, or on existing structures, which can be spaced 20 or more miles apart, the MM-9 Microwave "package" units provide an ideal low-cost solution to many point-to-point communications problems.

RCA Microwave uses highly directional radio signals which are beamed from one relay station to the next by "dish" antennas. It can be interconnected with existing telephone lines and switchboards and virtually eliminates the weather hazards of carrier and wire lines. RCA Microwave employs readily available tubes and familiar circuits which are easy to service. The RCA Service Company provides nationwide installation and service facilities, if desired.

For complete information on the new MM-9 Packaged Microwave Stations, send coupon, below.

Typical Uses of MM-9 Packaged Microwave:

1. Telephone Circuits
2. Supervisory Control
3. Remote VHF Control
4. Facsimile
5. Teletype

FOR

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Showing hinged rack construction, with all components easily accessible for servicing. Standard "package" equipment includes weather-proof cabinet, 2 parabolic reflectors, 960 megacycle transmitter unit, exciter unit, 960 megacycle receiver. Also 2 100-ft. sections of semi-flexible transmission lines with all required fittings. Space is available for multiplex equipment to provide two voice channels with signaling. Additional multiplex equipment can be mounted in a similar cabinet.

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Please send me your new booklet, "RCA Low-Cost Packaged Microwave Stations."

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Four areas which show that

SERVICE HELP IS AVAILABLE

Here's the kind of help available with every General Electric distribution transformer you buy:

Engineering help. Sales and application engineers, transformer specialists are available to every customer. Highly trained, these men can provide valuable assistance in your planning or day-to-day problems.

G-E service shops—31 throughout the country—are as close as your telephone. They are ready to help you in any emergency or to give routine service in your maintenance program.

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G-E warehouses. 45 easy-to-reach places where thousands of G-E transformers are stocked. You can get off-the-shelf delivery of almost all standard ratings. 431-24

*ATANA. When you need service, remember *All Transformers Are Not Alike* and go where the help you need is always available. General Electric Company, Schenectady 5, New York.

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take your choice
General Electric makes both

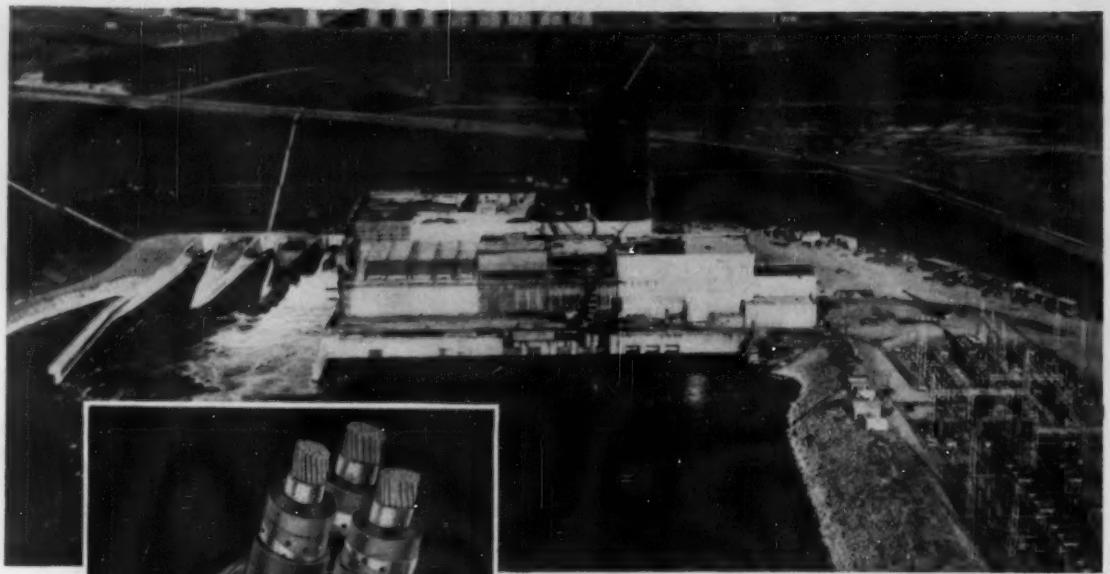
Progress Is Our Most Important Product

GENERAL ELECTRIC

These high-voltage compression

BAKELITE Polyethylene

TRADE-MARK



Garrison Dam—The first 230,000-volt cable in the United States will serve the country's largest earth-filled dam shown under construction on the Missouri River at Riverdale, N. D., by Army Engineers. Switchyard is at right, powerhouse and surge tanks at center, intake structure at embankment's far side. Cable is sheathed with polyethylene 60 mils thick, armored with 5-mil bronze tape intercalated with polyethylene tape. This sheath protects the cable against moisture, abrasion, and other hazards in storage, shipping, and installation.

Cross-section of cable used at dam shows heavy-duty construction similar to those at the other installations pictured here.

SUPERIOR MOISTURE RESISTANCE MAKES POLYETHYLENE IDEAL PROTECTIVE SHEATHING FOR INSULATION.

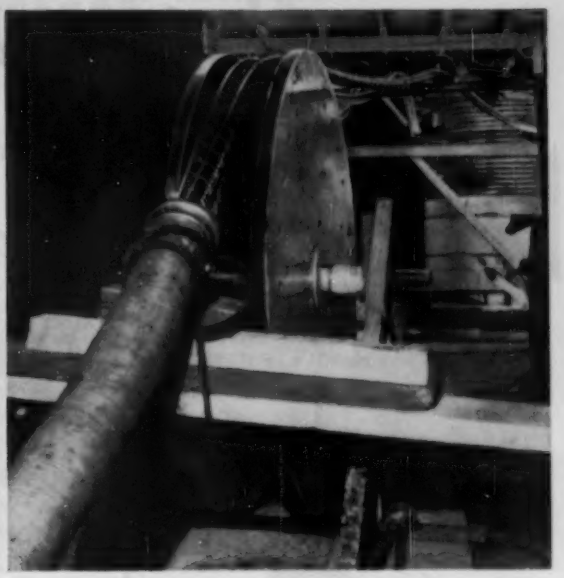
The three installations shown here are among the more significant applications of power cable recently developed in this country. All of them employ compression cable manufactured by *Phelps-Dodge Copper Products Corporation*. The cable sheathing is BAKELITE Brand Polyethylene. This material was selected because of its superior moisture resistance, an important factor in safeguarding the cable insulation in transit, while awaiting installation, and during the pulling-in operation. It also eliminates contamination.

BAKELITE Polyethylene has a number of additional service properties that are of wide interest. Some of them are described in the box at right. For details, write Dept. GH-53.

cables can't risk moisture!

sheath keeps them safe

Transonic Wind Tunnel nearing completion at the Air Force's Arnold Engineering Development Center near Tullahoma, Tenn., will develop wind velocities approximately 1000 miles per hour. It is served by an underground cable system consisting of 7 lengths of 161 kv pipe-type cable totaling 9000 feet, in an 8¾ in. steel pipe filled with oil at 200 psi. Each cable incorporates 650 mils of impregnated paper insulation protected during storage, transportation, and installation by a 65-mil sheath of polyethylene.



Under The Narrows—The longest 138,000-volt cable in the world—6800 feet without a splice—lies under the Narrows in New York harbor. This picture shows three compression cables being pulled through their steel pipe simultaneously. Each triangular segmental conductor, 1.4 in. in diameter, is covered with a 560-mil thickness of oil-impregnated paper insulation with a copper shielding tape under an 80-mil BAKELITE polyethylene jacket. This sheath protects the insulation throughout storage and installation periods.

BAKELITE Polyethylene also excels in Dielectric Properties, Chemical Resistance, Physical Characteristics.

Extremely low dielectric constant and low power factor are two major advantages of BAKELITE Polyethylene. At 25 deg. C. and 50 MC, dielectric constant is only 2.35, and power factor, which has essentially no variation with frequency, is 0.0005.

BAKELITE Polyethylene is extremely inert, possessing high resistance to chemicals. The black compound exhibits excellent weathering characteristics. Since BAKELITE Polyethylene is the lightest commercial plastic, it makes handling easier. Its flexibility and toughness are important factors governing its durability.

Learn more about the contribution BAKELITE Polyethylene can make to efficient, dependable distribution of power. Write Dept. GH-53 for copies of "Kabelitems" Nos. 75, 79, and 81.

BAKELITE
BRAND
Polyethylene Plastic

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

IT'S HERE the NEW KEYSTONE HDG LADDER MOUNT

Pictured 12" wood strain insulators in truss rods of fly and lower ladders.

This new mount is the answer to horizontal rotating problems on high crowned roads or inclines.

1. Gear box containing two-speed, self-locking worm gears.
2. Two-throw handle.
3. Hand wheel for raising fly ladder.
4. Eight position lock for vertical raising of entire ladder.
5. Vertical ladder with knurled rungs for safety.

New Keystone HDG Ladder Mount equipped with two-speed, self-locking gears for easier horizontal rotating and 12-inch wooden insulators in truss rods.

The new gear box sealed to permit gears to operate in lubricant.

1. Two-throw handle allows operator to select operating speed desired.
2. Low speed, high torque shaft (top) and high speed, low torque shaft (center) affords easy operation regardless of high crowned, inclined or level road.

ELECTRIC SERVICE MANUFACTURING CO.

The ONLY Mechanical Ladder Easily Operated on High Crowned Roads or Inclines

Two-Speed, Self-Locking Gears Make Easy Horizontal Rotating

HIGH CROWNED OR INCLINED ROADS NO PROBLEM Overcoming one of the greatest difficulties of ladder mounts, that of horizontal positioning on high crowned or inclined roads, was the prime factor in engineering the new Keystone HDG Ladder Mount. Now with the new two-speed self-locking gear-driven Keystone HDG Ladder Mount, one man can easily spot the ladder in infinite number of horizontal positions. No tugging against heavy load due to necessity of parking on an incline.

WHY IS THE HDG EASIER TO OPERATE? With two shafts—low speed with high torque or high speed with a low torque—plus a two-throw handle, permits operator to select gear ratio best suited for operating conditions. With hardly any effort on operator's part, ladder may be spotted or returned to ladder rest with ease.

WHAT MAKES OPERATING SO EASY? Enclosed in a precision machined gear box are double reduction worm gears. Dirt, dust, moisture and other harmful materials are sealed out to give longer gear life. All gears run in a lubricant to reduce friction. Adjustments for better gear operations can be made when necessary by one screw on the outside of the gear box. All this adds up to easier operation, higher efficiency and longer life with minimum maintenance.

SAFETY FIRST, LAST AND ALWAYS Keeping in mind the operator's safety, the Keystone HDG Ladder Mount is ruggedly constructed to prevent deflection, side sway and twisting. New 12" wooden insulators are now standard equipment in the truss rods of the fly and lower ladders. Metal rungs on the vertical ladder are knurled to prevent slipping. All wooden rungs are backed up by a safety tie bar on the lower side. Ladder locks in any horizontal and eight vertical positions. Handwheel raises and lowers fly ladder eliminating loose rope on the truck floor. A handwheel brake stops or retards descending fly ladder.

COMPACTNESS AND FLEXIBILITY Keystone HDG Ladder Mount can be rotated horizontally through a complete 360 degrees and locked in infinite number of positions. Ladder Mount fits conventional truck chassis and requires a 42" diameter for mounting purposes. Available in 24, 28 and 32-foot lengths.

Write today for more information on the NEW Keystone HDG Ladder Mount.

Philadelphia 32, Pa.

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto

This weather protected housing means dependable service

with the KEARNEY TRIPOMATIC

Notice how the lead-in holes for the back-connected terminals *do not enter* the cartridge chamber. This eliminates the source of most troublesome dirt and moisture. And see how the contacts and hanger bracket are *bolted through* the massive porcelain wall. They can never pull out like cemented attachments.

KEARNEY's exclusive *spring* contacts cushion the impact of tube recoil, protecting and prolonging the life of the cutout. The contacts stay in adjustment for high contact pressure . . . even after long service.

274

For Better Construction . . . Safer Maintenance

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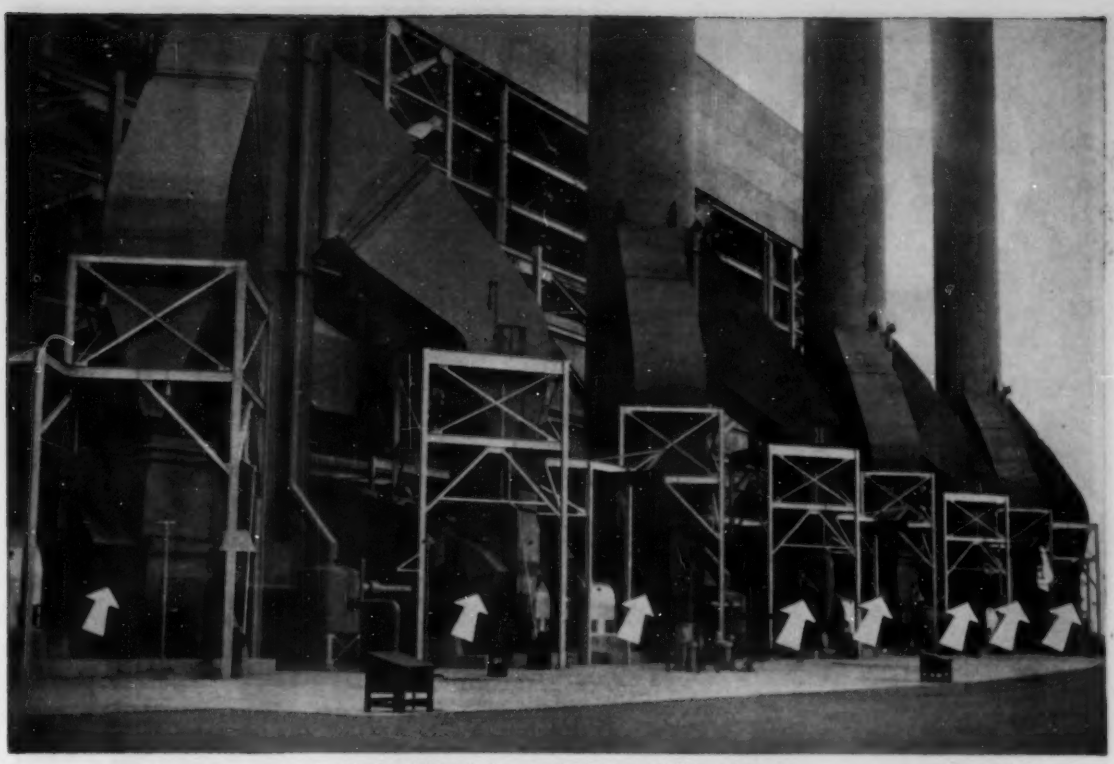

Pacific Gas & Electric Company's Pittsburg (California) Station

New Pacific Gas & Electric's Pittsburg Station . . . 660,000 KW . . . Uses 16 Westinghouse Mechanical Draft Fans

Largest Steam Plant in West Uses Westinghouse Fans for Induced and Forced Draft

Here, eight Forced Draft and eight Induced Draft Westinghouse Fans and Motors serve four boilers, each producing 1,135,000 pounds of steam per hour at 1850 psig and 1,000° F.

Two Forced Draft Fans driven by 900 hp motors provide 219,000 cfm each at 20.1" static pressure.

Two Induced Draft Fans driven by 920/1250 hp motors move 358,000 cfm at 375° F., 10.7" static pressure to each boiler with provision for coal firing.

These mechanical Draft Fans are specifically designed for outdoor installation.

For power generation—or for any other air handling job, let Westinghouse-Sturtevant put air to work for you—economically, efficiently.

FOR MORE FACTS on the industry's most complete air handling line, call on the "Man with the Facts", your Westinghouse-Sturtevant Sales Engineer, or fill in the handy coupon below.

Over-all view of Pacific Gas & Electric Company's Pittsburg Station showing four huge boilers and 16 Westinghouse Forced Draft and Induced Draft Fans.

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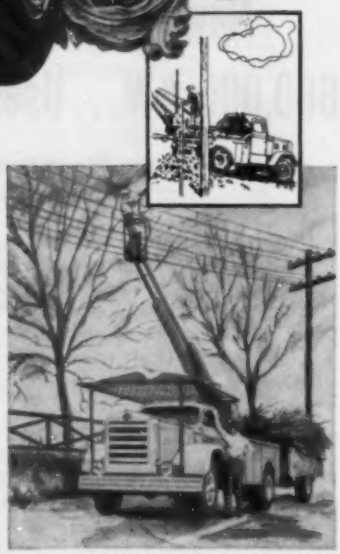
This basic unit of heavy-duty driving power is designed to out-perform mass produced, mass marketed trucks on the basis of extra power, dependability and economy of operation. Advanced *Math-Matic Design*—in every feature of FWD—correctly proportions power to weight on front and rear axles . . . makes every pound of load help haul itself, turns every ounce of power into more controllable traction and greater steering safety. You'll find FWDs shouldering more than their share wherever there's tough, heavy work to be done. Let us show you how FWD fits into *your* picture . . . contact your FWD Dealer today!



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MATH-MATIC DESIGN

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For Greater Profits Through Lower Costs

Could You Handle a 300% Surge in Service Calls in One Day, with no Stress or Strain?

This Customer Service System, at work in a New England public utility, boosts public relations daily and cuts costs. All service records on a given group of street addresses "belong" to one clerk, who handles any call for service or information within her group promptly and accurately, *before* the customer leaves the phone. This eliminates duplicate and inaccurate orders, speeds service and cuts truck time of men performing the work.

In the pocket corresponding to each street location are a master card, a traveling meter order, and a traveling service investigation form which serves to originate actual field maintenance. For more details on this Customer Service System and its huge potential, see Booklet X1498.

Unit Bookkeeping Plan Ends Specialized Customer Accounting, Adds "Point-of-Use" Record Protection

Under the Unit Plan, all "bill information" inquiries are answered quickly from this one source . . . the Unit Plan Safe-Desk. Records stay at a desk permanently, and each clerk becomes familiar with "her" 8,000 to 9,000 accounts, boosting accuracy, production and morale.

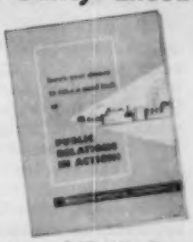
The Unit Plan provides for fair comparison of quantity and quality of work performed by each clerk. And, insulated Safe-Desks protect records from fire at "Point-of-Use" 24 hours a day. For more facts on Unit Plan Bookkeeping in the public utility field, read Booklet X1498.

Customer Service Counter Modern and Functional; Solves Customer Cashiering and Bookkeeping Problems

The new sectional customer service counter may be used alone, or with other units, to provide any desired number of work stations. The counter is open and friendly in appearance, promoting pleasant customer relations. It offers ideal counter height for making out checks and applications, plus a convenient, continuous parcel shelf.

The counter's compact working side holds all cashiering and bookkeeping facilities within arm's reach. Fatiguing, "stand-up" counter cashiering is eliminated. Certified insulated units protect valuable records at "Point-of-Use" 24 hours a day. Read more about this efficient public relations tool for public utilities in Booklet X1498.

12 Fact-Filled Pages For Public Utility Executives



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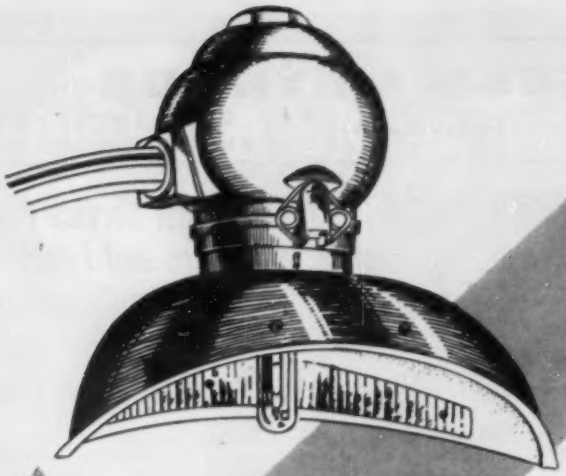

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100 WATT MERCURY STREET LIGHTING

✓ Performance plus! The 100-Watt admedium mercury lamp for which this WHEELER-engineered luminaire was designed produces 3,300 lumens initially. And although rated 4,000 hours, this WHEELER unit actually provides *average* service life of 15,000 hours to burnout. If burned for 8,000 hours, the average output over life is about 2,500 lumens — a schedule that drastically reduces lamp replacement costs. This lamp warrants broad acceptance, as shown by customer economic studies.

✓ Multiple ballast contained in EEI-NEMA head. (Series ballast externally mounted).

Typical installation: City of Northampton, Mass.

✓ Absence of enclosing glassware in uniquely successful Crescent reflector provides absolute minimum of first cost, plus fine optical performance without excessive glare. Types I, II and V distributions available.

✓ Sensitivity of the human eye to low intensities of blue light (Purkinje Effect) makes this lighting more effective than incandescent in fringe areas of low lighting intensity, such as residential areas.

✓ The WHEELER 100-Watt Mercury Street Lighting unit provides approach lighting of a similar blue-green color on secondary streets adjacent to high intensity mercury lighting installations.

Also available with integral photoelectric control for a completely self-contained street lighting unit, incandescent or mercury.

Wheeler STREET LIGHTING

SPECIALISTS IN SKILLED LIGHTING SINCE 1881
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Wheeler REPRESENTS THE MOST ADVANCED ENGINEERING IN STREET LIGHTING

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For heavy direct currents, the capacities of multi-bar busses are theoretically unlimited if adequate copper section and ventilation are provided. Flat bars require minimum space for making connections to apparatus without special joint preparation. They may also be bent flatwise or edgewise for making connections.

The 60-cycle a-c capacity of flat busses is limited to approximately 3000 amperes because of uneven current distribution. Laminated construction is used when space permits interlacing the phases to counteract "skin" and "proximity" effects.

There is a complete line of ANACONDA Copper Bus Conductor designs for every type of installation and power requirement. Write today for your copy of "ANACONDA Copper Bus Conductors" containing illustrations and detailed technical information. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.*

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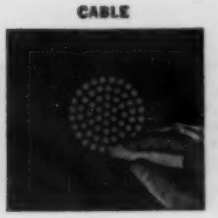
CABLE



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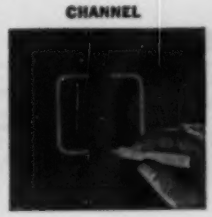
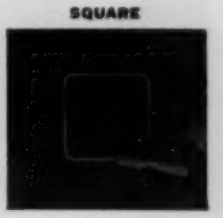
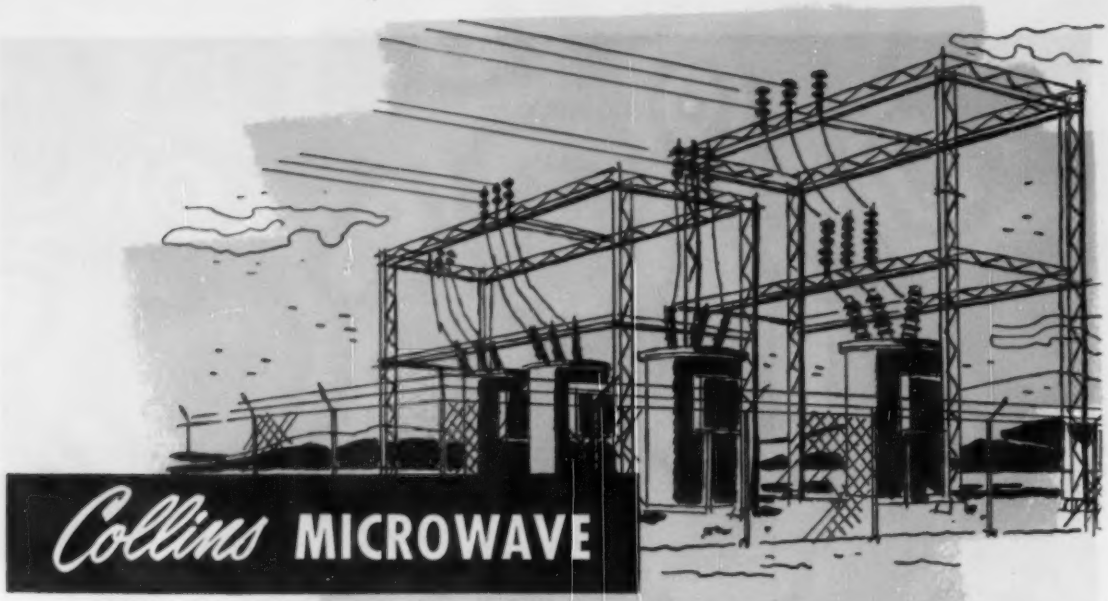


ROUND

SQUARE





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Power system loading, fuel-transmission coordination, and power pooling communication and control may be efficiently and economically handled with Collins microwave. Collins broadband microwave and mechanically filtered multiplex equipments assure reliable performance, high channel capacity and ease of maintenance. Building block construction plus single sideband modems allow flexibility in meeting today's needs with ready expansion as your operating area increases. Channels may be added for a large number of private telephone circuits as well as remote VHF station operation, high speed protective relaying, supervisory control, system telemetering, automatic load control, centralized office accounting and teletypewriter facilities.

Collins MICROWAVE and MULTIPLEX FEATURES

- LONG-LIFE REFLEX KLYSTRON provides reliable, broadband microwave transmitter.
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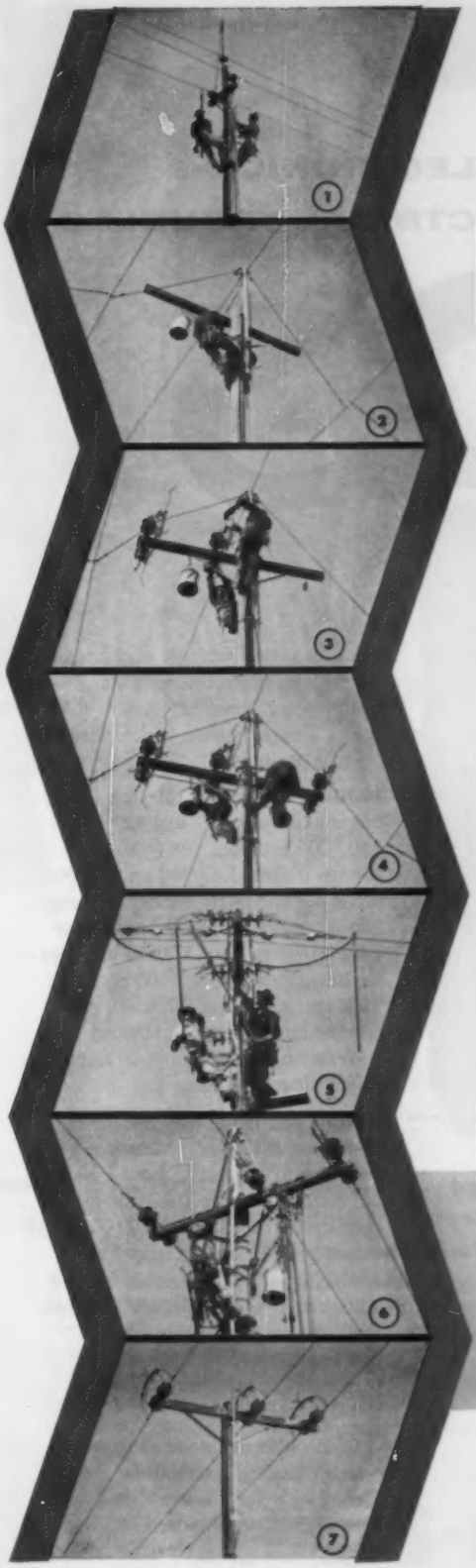


22 KV HOT LINE SWITCH INSTALLATION

in less than 6 hours

A unique feature of KPF Air Break Switches is the ease with which they can be installed on hot lines. An important reason for this convenience is the simple design of KPF switches. They consist of two rigid dead end insulator assemblies with rigid jumpers forming the switch arms. One assembly is mounted stationary to the cross-arms. The other rotates to make and break the circuit. There are no complex parts to get out of order, require lubrication, adjustment or service. KPF switches serve indefinitely, are shipped ready for use requiring only bolting to the cross-arm and connection of conductors.

Pictures alongside illustrate a 22 kv hot line installation typical of those made regularly by leading power companies using KPF switches.

1. Line crew on job at 8:30 A.M. Gin pole installed and linemen start to untie and spread hot 22 kv line 3/0 copper. **2.** Line wires spread and new cross-arms installed for KPF switch. **3.** Switch being installed. **4.** Switch installed and adjusted ready to cut-in. **5.** Bypass jumper and blocks installed. Lineman about to deadend 3/0 copper into automatic deadend attached to KPF switch. **6.** Lineman lowering last conductor into position to be cut into switch. **7.** Switch complete and ready for operation. Time 3:10 P.M.

Get catalog, complete specifications, write direct

KPF

AIR BREAK SWITCHES

Standard for nearly half a century

KPF ELECTRIC COMPANY

DEPT. E • 1624 E. ALPINE AVENUE • STOCKTON 5, CALIFORNIA

Quick Cure

FOR ELECTRONIC *and* ELECTRICAL TROUBLES

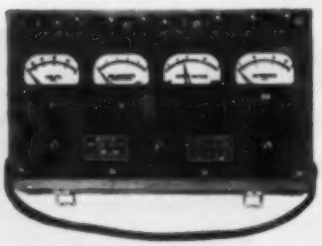
Model 785
Supersensitive
INDUSTRIAL ANALYZER

Model 633
A-C CLAMP VOLT-AMMETER

With these two versatile instruments, the maintenance department is equipped for 'most any trouble that comes along, even on new electronic control equipment.

MODEL 785, for example, has *seven* d-c voltage ranges, 1 to 1000 volts (20,000 ohms per volt)—*six* a-c voltage ranges, 5 to 750 volts (1000 ohms per volt)—*six* d-c current ranges, 50 microamperes to 10 amps.—*four* a-c current ranges, .5 to 10 amperes—*five* resistance ranges, 3000 ohms to 30 megs. All ranges full scale, and current ranges can be extended with external shunts. A complete electrical-electronic maintenance kit.

MODEL 633 is the real time-saver for motorized equipment. Measures a-c voltage and current without breaking the circuit. Has five full-scale a-c current ranges of 1000/250/100/25/10 amperes with range overlap for readability—three self-contained a-c voltage ranges of 700/350/175 volts; with all ranges available through convenient thumb switch, and provision for measuring motor starting current.



Model 639 self-contained POWER ANALYZER

—combines Voltmeter, Wattmeter, Power Factor Meter, Ammeter, *with all interconnections made.*

Both instruments are available through leading distributors. For literature, write Weston Electrical Instrument Corporation, 614 Frelinghuysen Ave., Newark 5, N. J.

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Country-Wide Field Stocks Provide *Fast Service*

ALLIS-CHALMERS

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Extend Your Own Transformer Stocks by taking advantage of the strategically located stocking points for Allis-Chalmers distribution transformers. From every part of the country you can get fast, convenient shipment to meet your day-to-day needs.

Local stocks maintained for customer convenience by Allis-Chalmers include conventional distribution transformers as well as self-protected and overload-indicating transformers. Stocks include instrument transformers. All units are available in most popular ratings.

Check your distribution transformer needs today. Find out how nearby A-C stocking points can help you solve the stocking problem. Contact your nearest A-C distributor or office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Bonus-Pallet Crates Cut Warehousing Costs

Crated distribution transformers can be stored more easily in your warehouses with Allis-Chalmers new pallet-bottom crates. Crated transformers are easier to move, can be stacked higher and more safely.

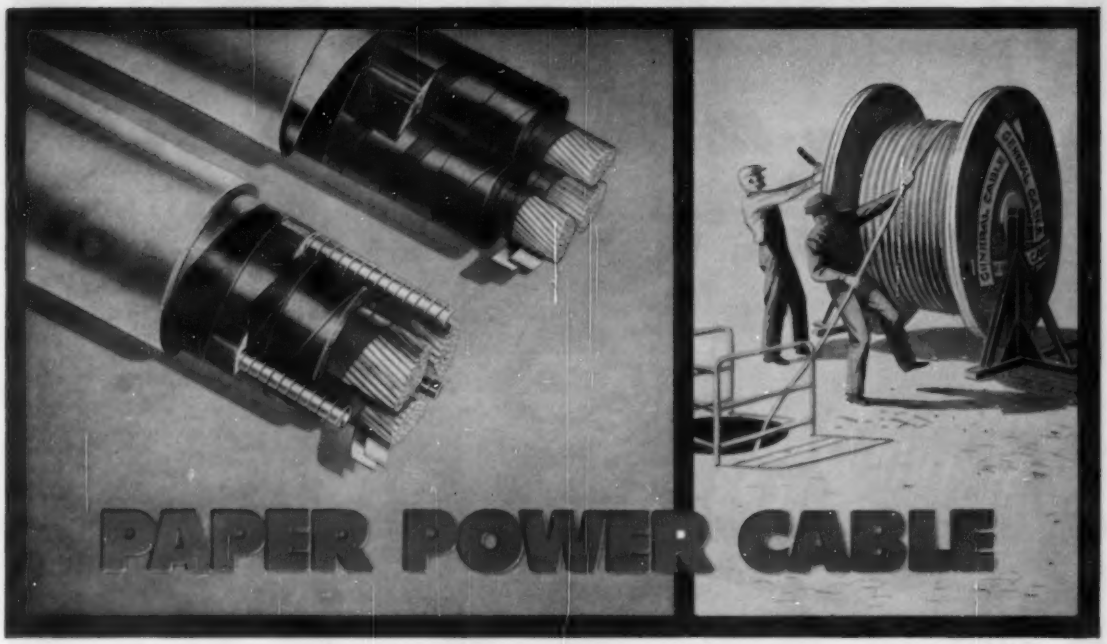
Best of all, when the transformer is removed, the crate bottom can be removed from the crate and converted into a re-usable pallet for handling other materials.

A-4782

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE



Pioneers in the development of Paper Power Cables, General Cable Engineering leadership and manufacturing skill is combined to provide a *uniformly high quality product.* Conductors are made to finest possible tolerances, insulations are thoroughly tested and inspected before and after assembly — in fact, *every* step of manufacture is under the most rigid quality control.

The biggest producer, General Cable also makes the widest range of types. For example: solid, low pressure gas-filled, low pressure oil-filled, high pressure oil-filled (pipe type), high pressure gas-filled (pipe-type), and high pressure oil or gas-filled (self-contained).

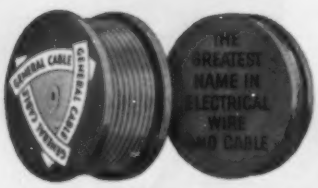
Available in widest range of conductors: Compack Round, Concentric, Compack Sector, Annular Concentric, Compack Segmental, Hollow Core.

Made in largest variety of finishes: Jute, Duck Tape, Reinforced Neoprene, Synthetic Plastics, Flat Steel Tape or Steel Wire Armor.

The forementioned represent but a few of the wide range of types manufactured by General Cable... plus other types made to customer specifications.

Next time you're talking Paper Power Cable . . . or any type of electrical wire and cable, call in your friendly General Cable Representative... there's one near you.

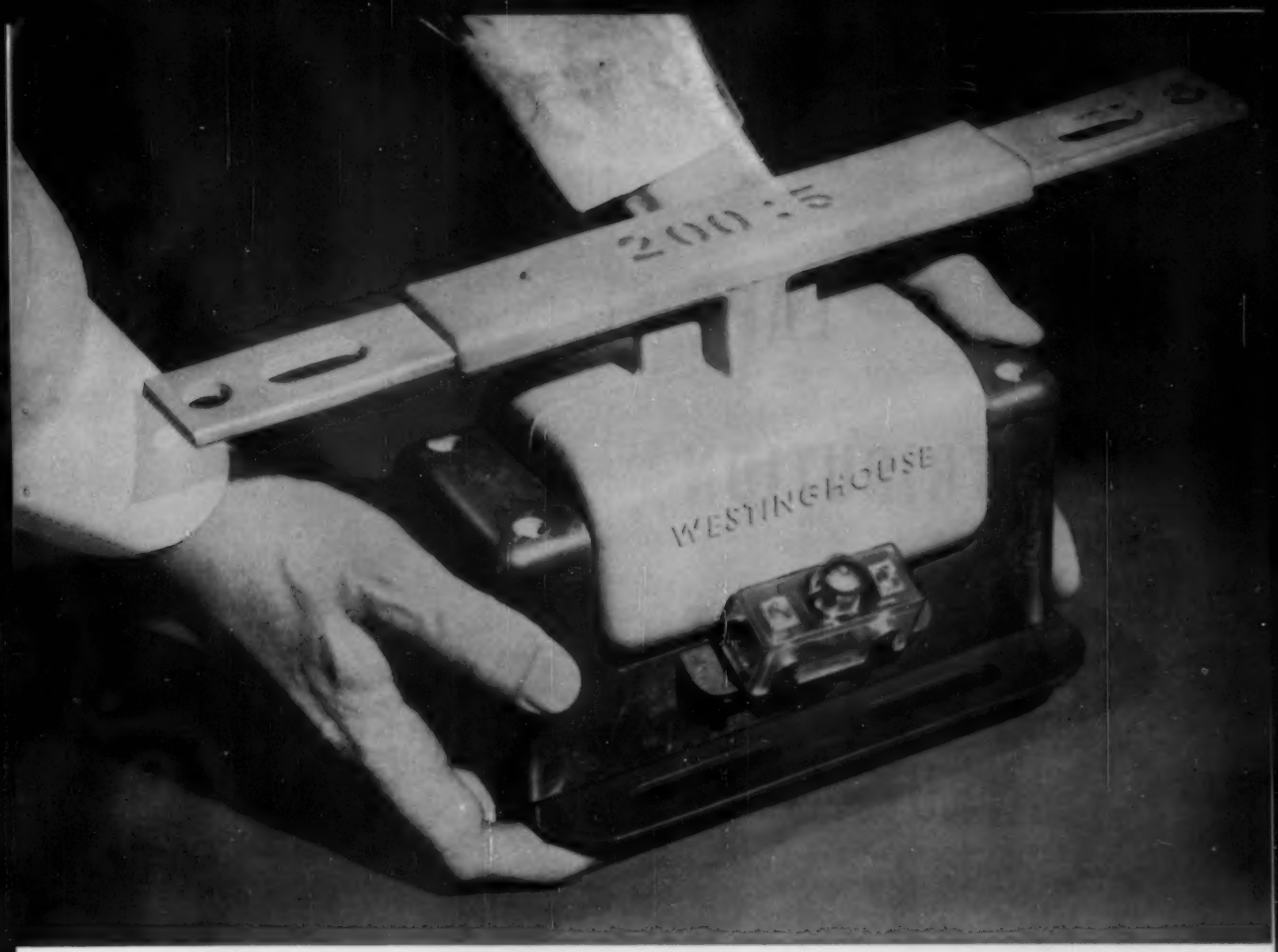
GENERAL CABLE
CORPORATION



BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

GENERAL CABLE CORPORATION
Executive Offices: 420 Lexington Ave., New York 17, N. Y.

SALES OFFICES: Atlanta • Baltimore • Boston • Buffalo Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit Erie (Pa.) • Greensboro (N. C.) • Houston • Indianapolis Kansas City • Lincoln (Neb.) • Los Angeles • Memphis Milwaukee • Minneapolis • New Haven • Newark (N. J.) New York • Philadelphia • Pittsburgh • Portland (Ore.) Richmond (Va.) • Rochester (N. Y.) • Rome (N. Y.) St. Louis • San Francisco • Seattle • Springfield (Ill.) Syracuse • Tampa • Tulsa • Washington, D. C.



TYPE SM-5 CURRENT TRANSFORMER (indoor service)

Molded in silicone— lightest, smallest, most durable 5-kv unit built!

The Westinghouse Type SM-5 current transformer is silicone insulated throughout—has a rating factor of 1.5 and has 0.3 accuracy class for all metering burdens—meets all ASA and NEMA Standards—yet is smaller, lighter and more durable than any 5-kv unit built to date.

The exclusive new silicone-base insulating material is permanently molded to the core-coil assembly—is impervious to atmospheric condition—has high dielectric strength, low insulation power factor, high resistance to electric creepage, abrasion or rough handling. It does not age under temperature, sunlight or humid conditions.

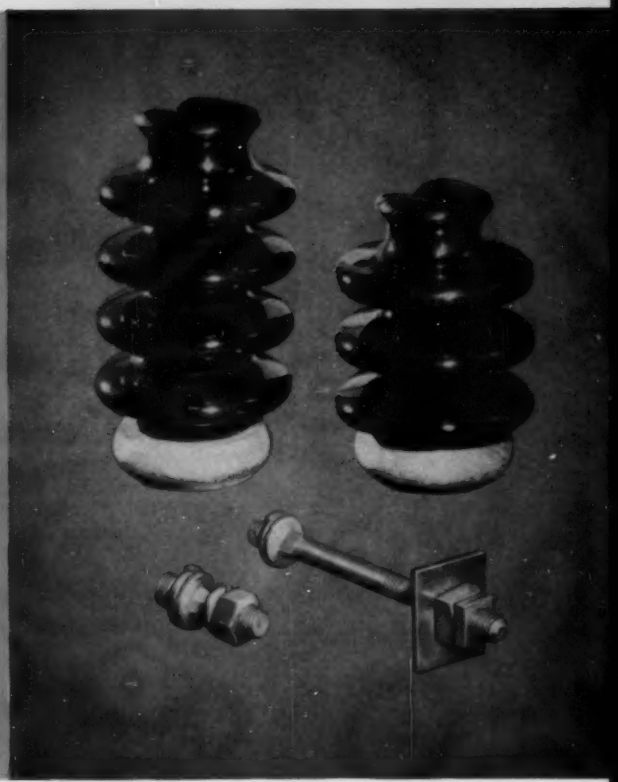
Exclusive Hipersil® Type C cores, complete mounting flexibility, an automatic or manually operated short-circuiting device, silver-plated primary terminals and other equally outstanding design features make the SM-5 the leader in its class.

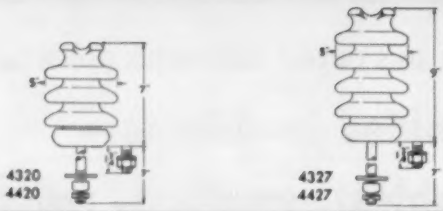
Get full details now from your local Westinghouse representative or write direct for booklet B-6396 Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70735

YOU CAN BE SURE...IF IT'S

Westinghouse

LAPP DISTRIBUTION POST INSULATORS





CATALOG NUMBER — Short stud unit / Long stud unit	4320 / 4420	4327 / 4427
DIMENSIONS		
Leakage Distance, inches	11	15
Dry Arcing Distance, inches	5.75	7.6
MECHANICAL VALUES		
Cantilever Strength, pounds	1500	1500
ELECTRICAL VALUES		
Recommended Line Voltage, Kv	20	27
Low Frequency Dry Flashover, Kv	80	95
Low Frequency Wet Flashover, Kv	55	65
Impulse Flashover—Positive, Kv	105	135
Impulse Flashover—Negative, Kv	130	190
RADIO INTERFERENCE		
Test Voltage Rms to Ground, Kv	15	15
Max. RIV, Microvolts at 1,000 Kc	100	50
PACKING AND SHIPPING		
Net Weight, each, pounds	7.7	9.5

. . . trouble-free insulation for lines operating at voltages up to 25 Kv

NOW all the operating security of the famous Lapp Line Post insulator for transmission duty is available in a new series of Lapp Post insulators for distribution use—at voltages up to 25 Kv.

SOLID ONE-PIECE PORCELAIN. The body is a solid porcelain without internal hole, machined all over including conductor and tie wire grooves. Base is externally attached and studs are interchangeable—any required length being available.

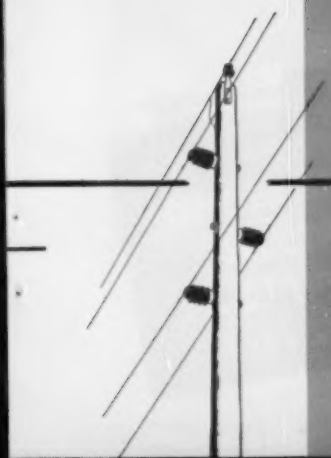
FOG-TYPE. Multiple short petticoats, characteristic of Lapp Fog-Type design, provide an exposed uniform leakage path and self-cleaning feature—most efficient for duty in contaminated atmosphere.

LIGHTNING- AND MECHANICAL-ATTACK RESISTANT. Short sturdy petticoats—such as have been proved by nearly 25 years of service on Lapp Line Posts—provide greatest protection from damage by arcover and attack by stones or bullets.

NO CRACKING. The porcelain, held in the large-area low-intensity grip of its cemented-on base, can be loaded only in compression. No internal bursting forces can develop—permanently free from cracking.

PUNCTURE-PROOF. Solid electrical porcelain from conductor to base—no internal conductive pins, or even air space. Completely puncture proof.

RADIO-FREE. The Lapp Post design is inherently free from radio interference—requires no treatment or coatings. Dependably and permanently free from radio or television interference.



A *BETTER* DISTRIBUTION LINE AT *LOWER* COST...

MOUNT LAPP POSTS *HORIZONTALLY*

You can eliminate cross-arms, braces, brackets and other hardware, by horizontal mounting of Lapp Distribution Posts. Such a line is trim and neat, and the insulators have even better electrical characteristics than when mounted vertically. (Several companies have used such a construction with regular Lapp Line Posts for periods up to 20 years—and they report that these lines have the best operating records of any lines on their systems!)

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

COME TO CROUSE-HINDS FOR

Special Purpose Lighting...

*Condulet**

EXPLOSION-PROOF FIXTURES

for N.E. Code Class I Locations

Operate at temperatures below ignition temperatures of surrounding explosive gas-air or vapor-air mixtures. Resist internal explosions without damage. Prevent escape of flames to surrounding atmospheres.

Condulet

DUST-TIGHT FIXTURES

for Class II Locations

Exclude combustible dusts from interior of fixture. Even when fixture is completely blanketed with dust, temperature of fixture will not cause ignition.

COME TO CROUSE-HINDS for Free-of-Charge Lighting Help . . .

CROUSE-HINDS Engineers will survey your layouts for lighting hazardous industrial locations . . . describe National Electrical Code safety regulations . . . suggest precautions to observe . . . recommend UL-approved fixtures for each danger-area, etc.

Condulet

FLUORESCENT FIXTURES

Fluorescent fixtures also available for Class I, Group C and D; Class II, Groups E, F and G; and Class III.

Condulet

VAPORTIGHT FIXTURES

for Class III Locations

Protect bulb, receptacle and wiring from moisture and corrosive vapors in damp locations. Enclosures are designed to prevent entrance of fibers and flyings, escape of sparks, burning material or hot metal.

*Trade Name Registered

● *Write, wire, or call your nearest Crouse-Hinds Office for complete details.*

A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

CROUSE-HINDS COMPANY

SYRACUSE 1, N. Y.

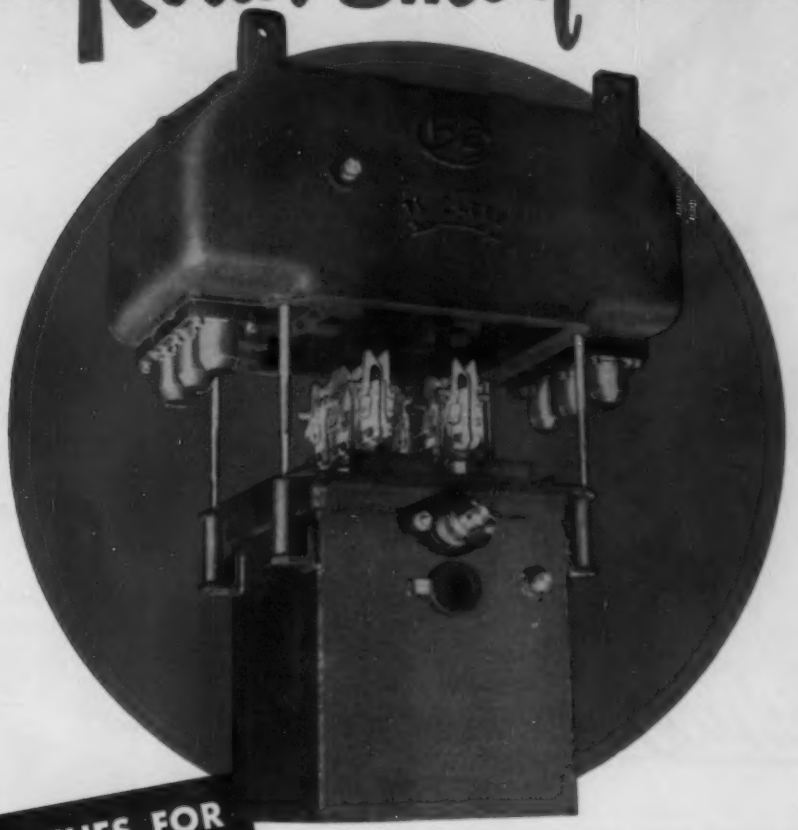
OFFICES Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Memphis, Milwaukee, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., St. Louis, St. Paul, San Francisco, Seattle, Tulsa, Washington. RESIDENT REPRESENTATIVES Albany, Atlanta, Baltimore, Baton Rouge, Charlotte, Chattanooga, Corpus Christi, Reading, Pa., Richmond, Va., Shreveport

Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

CONDULETS • FLOODLIGHTS • TRAFFIC SIGNALS • AIRPORT LIGHTING

Favorite of Engineers Everywhere . . .

THE FAMOUS Roller-Smith "SUBWAY SWITCHES"



OIL SWITCHES FOR UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEMS

Roller-Smith "Subway Switches"—so-called because they are used in many kinds of underground electrical distribution systems—deliver outstanding performance for several important reasons.

Draw-out construction permits the switching mechanism and tank to be removed or replaced without disconnecting the load cables. This assures safety in servicing because an interlock prevents removal or insertion of switching mechanism with switch in the "closed" position. All switches will safely interrupt twice their current rating. Construction is water-tight and switches may be operated even though submerged. An electrically-operated model (MS-1A) is available in weather-proof construction for pole or bracket mounting. "Subway Switch" Model MS-1 is rated 400 amperes, 4160 volts. Model MS-5 is rated 600 amperes, 13,800 volts. "Subway Switches" offer the same high quality, long life, and assured continuity of service that characterize the many other Roller-Smith products serving the electrical industry.

Roller-Smith
CORPORATION
ELECTRICAL SWITCHGEAR
BETHLEHEM, PENNSYLVANIA

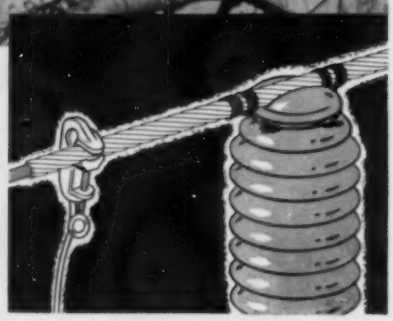
SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES—CANADIAN AND FOREIGN

Reduce TREE TRIMMING

Reduce maintenance expense . . . improve customer good-will by protecting your conductor with Preformed Line Guards. Metal or plastic guards available . . . all are accurately formed to fit snugly without loosening—ever. Easy to install—no tools needed.

These exclusive guards assure positive protection against the abrasive rubbing of tree limbs, corners of buildings, poles and other damaging objects. Dangers of grounding are eliminated . . . insulation life prolonged indefinitely. Conductor maintenance is nil.

For longer care-free service—a greater safety factor, specify Preformed Line Guards.



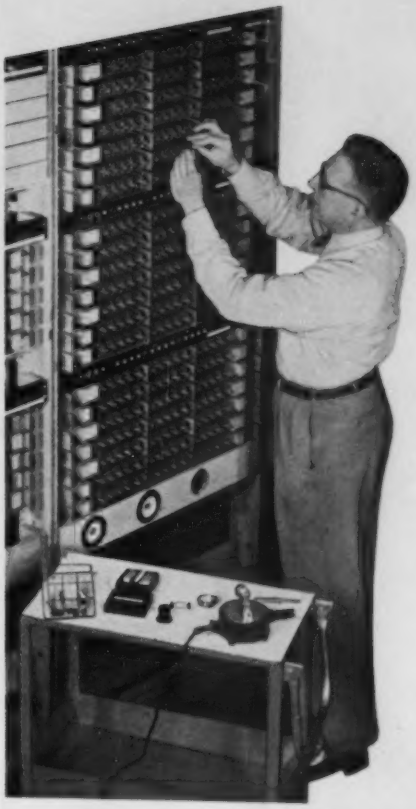
LINE GUARDS or ARMOR RODS

Line guards, a development from ARMOR Rods are used, like ARMOR Rods, to protect against arcover, chafing and mechanical wear due to concentrated stresses.

● *Made in accordance with or for use under one or more of the following U. S. Patents: 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.*

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO



He's "fingerprinting" a relay contact

Bell Laboratories microchemists have perfected an ingenious new technique for "fingerprinting" relay contacts, the tiny switches on which a dial telephone system critically depends.

Using a portable test set, a chemist makes a plastic print of a contact. On-the-spot examination of the print with a microscope and chemical reagents quickly reveals the effects, if any, of arcing, friction, dust or corrosive vapors. While the chemist studies the print, urgently needed contacts continue in service. Findings point the way to improve relay performance.

This is another example of how Bell Telephone Laboratories research helps to keep your telephone system the world's best.

Above, Bell Laboratories microchemist applies plastic disc in heated clamp to relay contact. Imprint reveals contours of surface and picks up contaminants, if any. Part of portable test set is shown on table. Contacts, shown in small sketches, are of precious metal fused to base metal.

Preparing disc for microscopic examination. On-the-spot examination may reveal acid, alkali, sulfur, soot or other polluting agents peculiar to an area.

A microscopic look at disc often provides lead to nature of trouble. Unlike actual contact, print can be examined with transmitted light and high magnification.

Here the plastic disc has picked up microscopic lint that insulates contact, stops current. (Picture enlarged 200 times.) Traces of contaminants are identified in microgram quantities. Inert plastic resists test chemicals that would damage contact.

Bell Telephone Laboratories

Improving telephone service for America provides careers for creative men in scientific and technical fields

WHAT HAPPENS NEXT?

If management has been wise, a fire tragedy will be stopped before it starts...if not, in 20 minutes extensive destruction and total loss could readily be the result.

First-rate fire protection is essential to the continued success of any business. With C-O-TWO Smoke or Heat Fire Detecting Systems, plus C-O-TWO High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing Systems, as well as PYRENE Air Foam Type Fire Extinguishing Systems for specific outdoor locations, your plant can have fast, positive round-the-clock fire watchman service simultaneously at each fire hazard point . . . a fire tragedy is stopped before it starts.

Furthermore, there is a personal sense of responsibility inherent with PYRENE—C-O-TWO Fire Protection Engineers that assures you of fully adequate firesafety . . . a definite plus in your behalf. Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . PYRENE—C-O-TWO means top quality backed by experienced engineering that results in operating superiority for you at all times.

Act now . . . don't take unnecessary chances with your investment any longer . . . the extensive experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Remember . . . a plant-wide fire protection survey skillfully executed today could be the means for greater profits tomorrow.

Pyrene

PYRENE — C-O-TWO

NEWARK 1 • NEW JERSEY

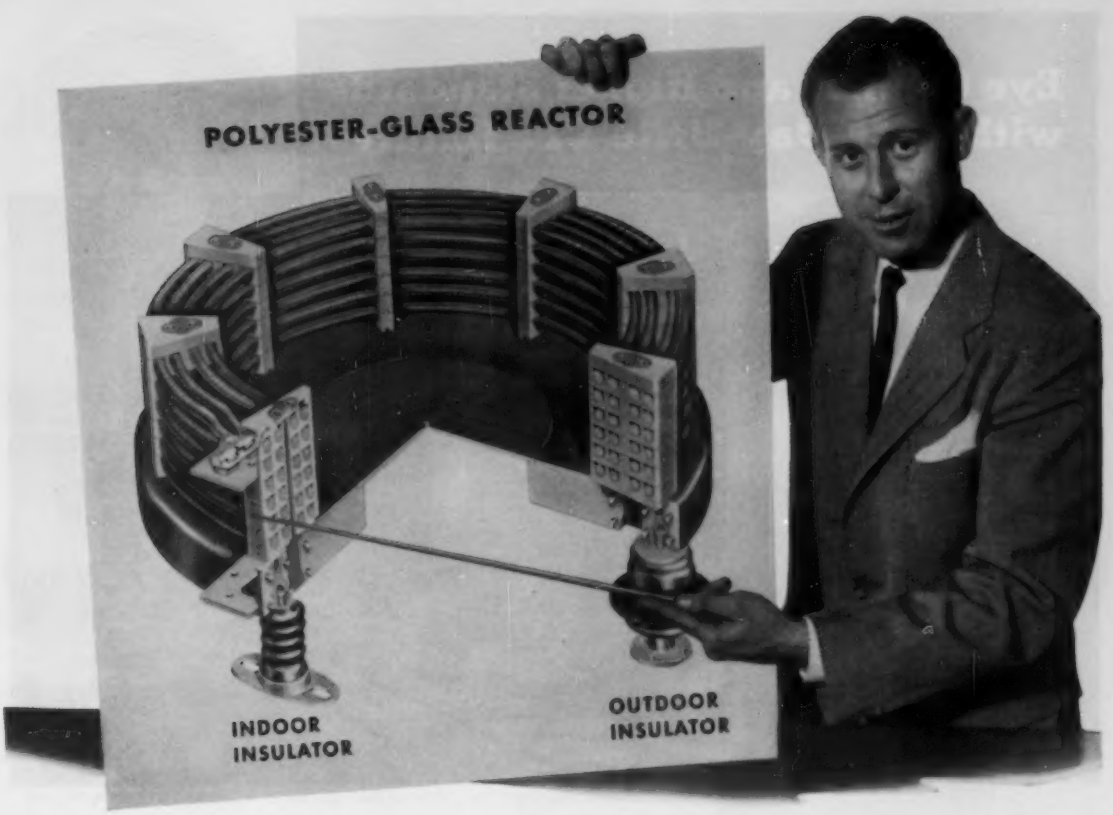
Sales and Service in the Principal Cities of United States and Canada

C-O-TWO

COMPLETE FIRE PROTECTION

portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM



"Ageless" materials make new reactor stronger, lighter, more durable

The news in the new line of Westinghouse current-limiting reactors is a polyester glass that is stronger and lighter by far than any material used before in reactor construction. This polyester not only solves the aging and maintenance problem, but also permits a 30% reduction in reactor size and weight.

This new material provides these outstanding characteristics: (1) Exceptional mechanical and electrical strength—3 times the compressive strength and 10 times the tensile strength of concrete. (2) Great resilience to thermal and mechanical shocks—will withstand the forces generated by heavy short circuits and expansion of conductors during overloads. (3) Unequaled durability — polyester is impervious to moisture and all atmospheric conditions. Unlike concrete, it will not age or deteriorate under normal operating conditions.

The cleats are solidly bonded together by a special high-strength reinforced resin. This results in greater column strength and greater resistance to short circuit stresses between units—permits closer spacing between reactors, without the use of braces.

These new, smaller Westinghouse dry-type reactors are available in all ratings for indoor and outdoor service. For more complete information, call your nearby Westinghouse sales engineer, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70753

YOU CAN BE SURE...IF IT'S Westinghouse

Eye Comfort and Higher Standards with New Day-Brite CFI fixtures

Just seeing isn't enough, even if illumination is considered adequate. It's eye comfort that makes the big difference, as the above "before and after" photograph of the same work area clearly shows.

To assure needed eye comfort for workers—resulting in higher efficiency and morale—Day-Brite is offering a new concept in industrial lighting. It is the famous Day-Brite CFI fixture—so-called because CFI means *C*omfort *F*or *I*ndustry. This new unit washes out ceiling contrasts, which can result in nervous and muscular fatigue.

There are two CFI units available—the CFI-10 (which provides a 10% upward lighting component) and the CFI-25 (which provides a 25% upward component). They are designed to meet any seeing requirements in industry.

SEE! EXAMINE! COMPARE! The safest way to assure yourself of selecting the right fixture is to make a point-by-point comparison of various fixtures under consideration. Then choose on the basis of the evidence.

CALL YOUR DAY-BRITE REPRESENTATIVE! Long experience makes him competent to advise you.

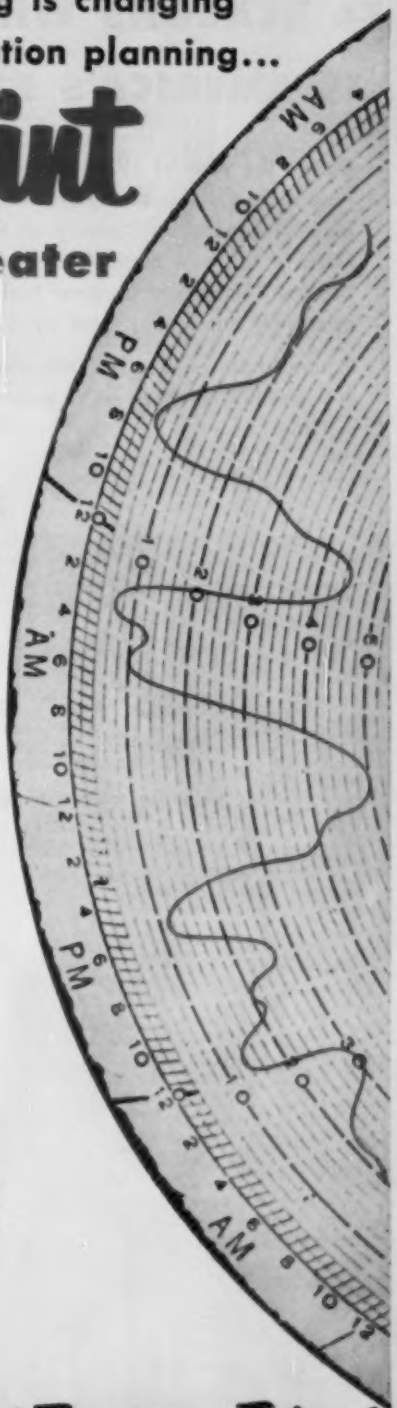
Day-Brite Lighting, Inc., 5417 Bulwer Ave., St. Louis 7, Mo.

5454

NATION'S LARGEST MANUFACTURER OF COMMERCIAL & INDUSTRIAL LIGHTING EQUIPMENT

Air conditioning is changing load and distribution planning...

Now Hotpoint Offers a Water Heater That Fits This New Load Trend!



the new Hotpoint super-speed automatic

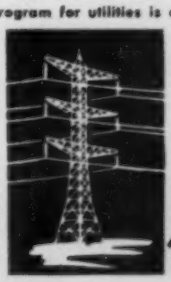
A progressive idea in electric water heating—the new 40-gallon Hotpoint Super-Speed Automatic meets the maximum hot water needs of 95% of all users everywhere . . . provides more than 6 times the needs of the average family.

Actual laboratory tests have proved the new Super-Speed equals or out-performs any rated heater of comparable size, regardless of heat source. It can deliver 30% to 60% more hot water every 24 hrs. than a standard 82-gal. heater—60 to 90 gallons of hot water in less than 2 hrs.—up to 470 gallons every day! Recovery? From a cold start, with 50° water, it delivers enough hot water for 3 shower baths in just 25 minutes . . . enough really hot water for an automatic washer load in about an hour.

This fast recovery heater peaks at mid-morning when the residential load is usually low. In companies already providing, or contemplating, increased distribution facilities for air conditioning, this is a time when additional use of these facilities will be advantageous.

Of course load and demand figures must be related to your local situation. Many major utilities are now testing Super-Speed heaters on their lines. A limited number have already completely embraced this new fast recovery idea and are actively merchandising "better hot water service at no extra cost."

If you would like to see what the new Super-Speed will do for your load and merchandising picture—write to Utility Division, Hotpoint Co. The new Hotpoint Super-Speed program for utilities is completely flexible.



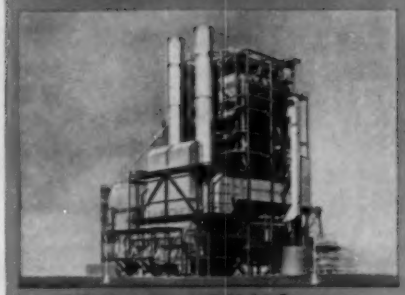
Again, Hotpoint looks at Tomorrow, Today!

HOTPOINT CO. *(A Division of General Electric Company)* **5600 West Taylor Street, Chicago 44, Illinois**

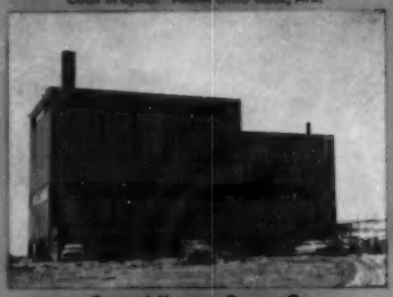
54 REASONS WHY ELECTRICITY IS AMERICA'S BEST BARGAIN

During the year of 1954 America's electric utilities broke all records in placing nearly 12 million kilowatts of new, highly-efficient generating capacity on the line. Over 6 million kilowatts of this new capacity are served by Babcock & Wilcox boilers. This is the greatest boiler capacity ever placed in operation during any year by a single boiler manufacturer.

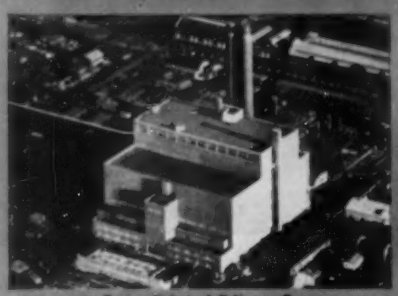
Pictured here and on the following pages are the 54 stations in which one or more B&W boilers were placed in operation in 1954.



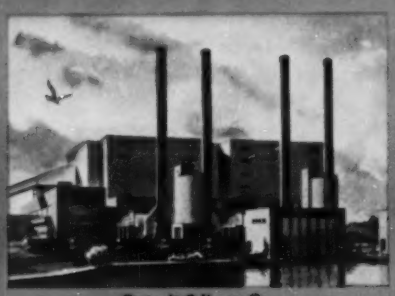
Arkansas Power & Light Company
Cecil S. Lynch North Little Rock, Ark.



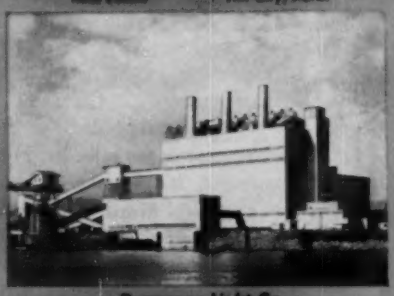
Central Kansas Power Co.
Russ Booth Hill City, Kans.



Consolidated Edison Co.
Astoria New York, N. Y.

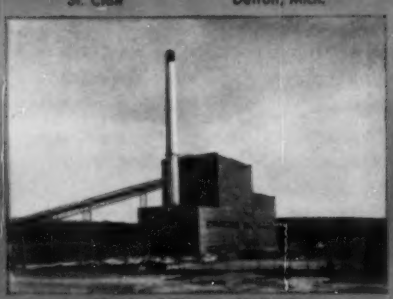


Detroit Edison Co.
St. Clair Detroit, Mich.



Duquesne Light Co.
Elrama Elrama, Pa.

City of Greenwood, Miss.
City Plant Greenwood, Miss.

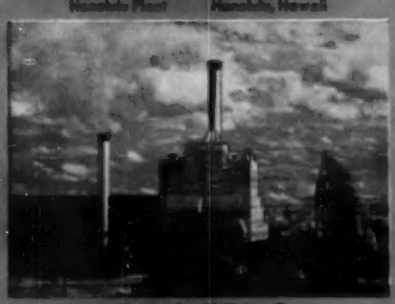


Hartford Electric Light Co.
Middletown Middletown, Conn.

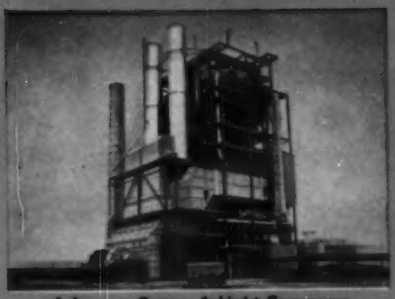
Hawaiian Electric Co.
Honolulu Plant Honolulu, Hawaii

Iowa Power & Light Co.
Des Moines Des Moines, Iowa

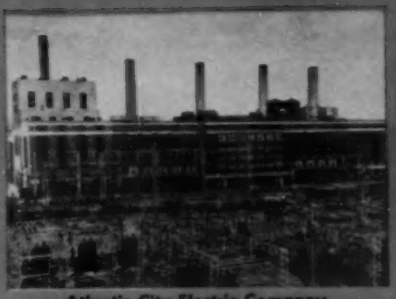
Iowa Southern Utilities Co.
Eddyville, Iowa



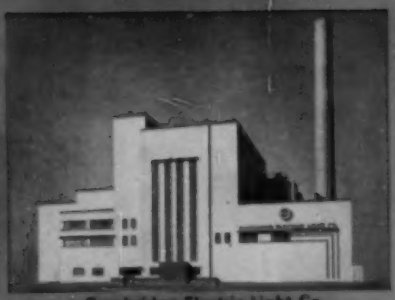
Kentucky Utilities Co.
Green River So. Carrollton, Ky.



Arkansas Power & Light Company
Harvey Couch Stamps, Ark.



Atlantic City Electric Company
Deepwater Deepwater, N. J.

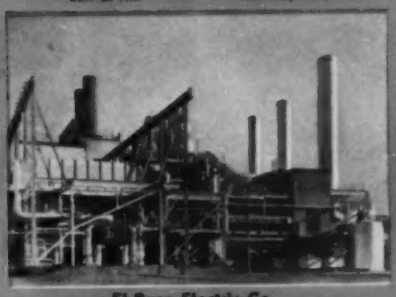


Cambridge Electric Light Co.
Kendall Square Cambridge, Mass.

Central Power & Light Co.
Lon C. Hill Lon Hill, Tex.

Cincinnati Gas & Electric Co.
W. C. Beckjord New Richmond, Ohio

Commonwealth Edison Co.
Ridgeland Stickney, Ill.



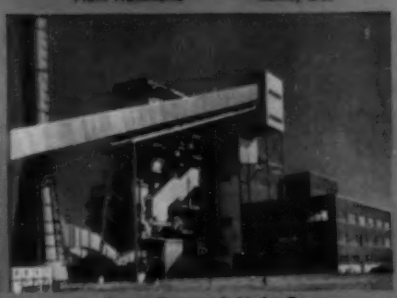
El Paso Electric Co.
Rio Grande El Paso, Tex.

Florida Power Corp.
Suwannee River Ellaville, Fla.

Georgia Power Co.
Plant Hammond Rome, Ga.

Houston Lighting & Power Co.
Webster Webster, Tex.

Indiana & Michigan Electric Co.
Tanners Creek Lawrenceburg, Ind.



Iowa Power & Light Co.
Council Bluffs Council Bluffs, Iowa

Lake Superior District Power Co.
Bay Front Ashland, Wis.

City of Lansing
Moores Park Lansing, Mich.

City of Los Angeles
Valley Los Angeles, Calif.

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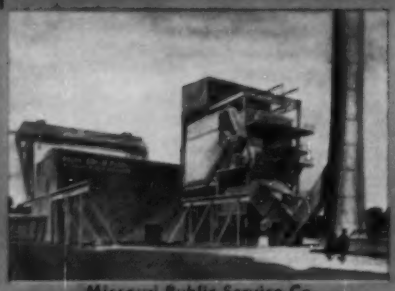
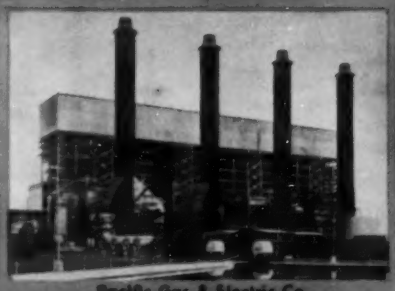


Missouri Public Service Co.
Ralph Green — Pleasant Hill, Mo.

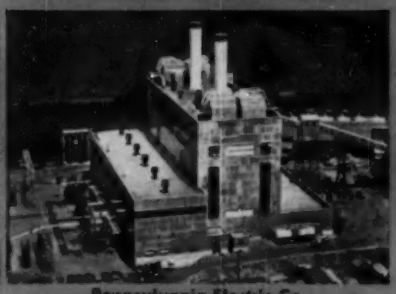
New England Electric System
South Street — Providence, R. I.

New Orleans Public Service Inc.
A. B. Paterson — New Orleans, La.

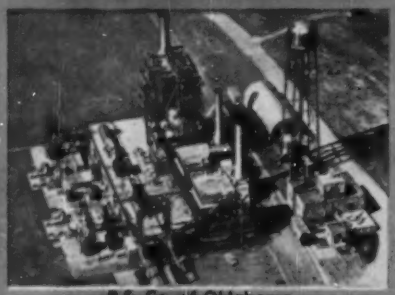
Orlando Utilities Commission
Orlando — Orlando, Fla.



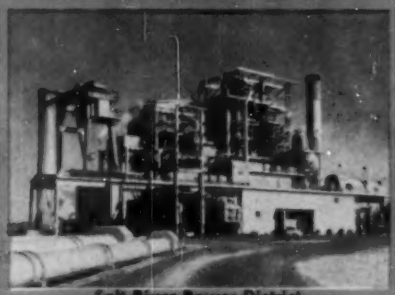
Pacific Gas & Electric Co.
Pittsburg — Pittsburg, Calif.



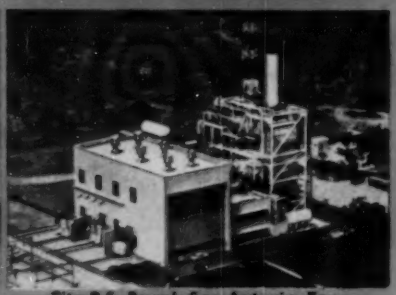
Pennsylvania Electric Co.
Shawville — Shawville, Pa.



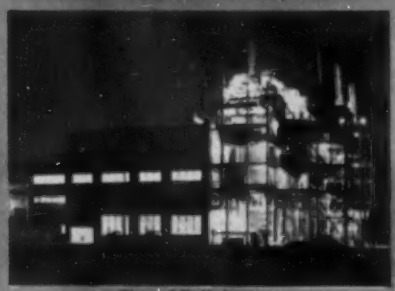
P.S. Co. of Oklahoma
Southwestern — Washita, Okla.



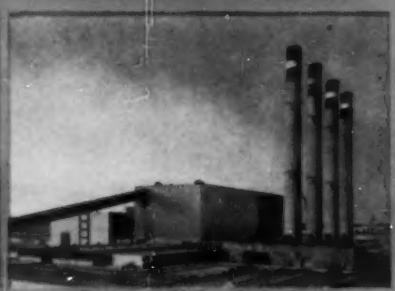
Salt River Power District
Kyrene — Tempe, Ariz.



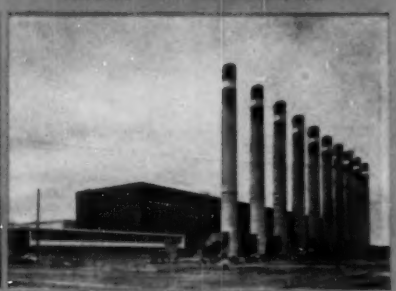
City P.S. Board, San Antonio, Tex.
Northside — San Antonio, Tex.



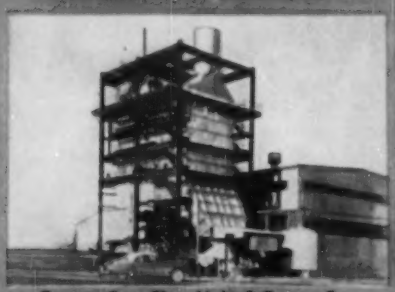
City of Tallahassee
St. Mark's — Tallahassee, Fla.



Tennessee Valley Authority
Colbert — Tuscumbia, Ala.



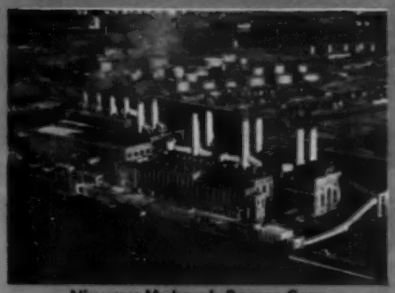
Tennessee Valley Authority
Shawnee — Childs, Ky.



Tucson Gas, Elec. Light & Power Co.
De Moss Petrie — Tucson, Ariz.

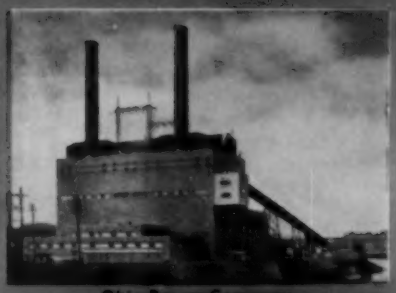
West Penn Power Co.
Springdale — Springdale, Pa.

Wisconsin Power & Light Co.
Rock River — North Beloit, Wis.

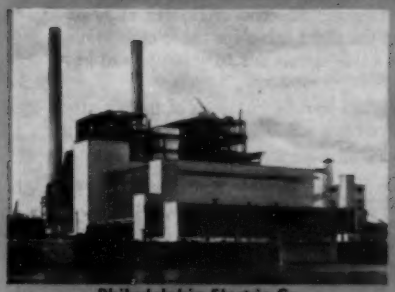


Niagara Mohawk Power Corp.
Huntley Buffalo, N. Y.

Ohio Edison Co.
Niles Niles, Ohio



Ohio Power Company
Muskingum River Beverly, Ohio

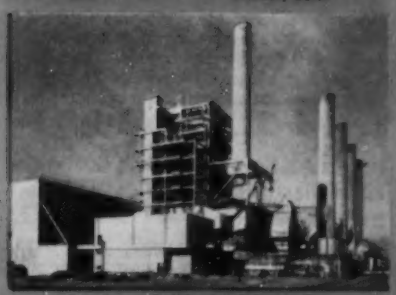


Philadelphia Electric Co.
Cromby Phoenixville, Pa.

P.S. Co. of Colorado
Zuni Denver, Colo.

P.S. Co. of New Mexico
Person Albuquerque, N. Mex.

San Diego Gas & Electric Co.
Encina Carlsbad, Calif.

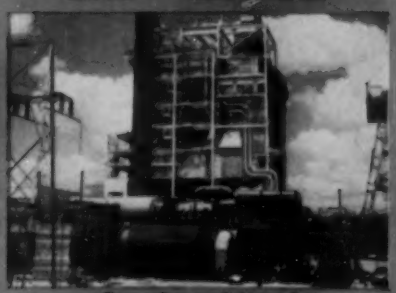


Southern California Edison Co.
Redondo Beach Redondo Beach, Calif.

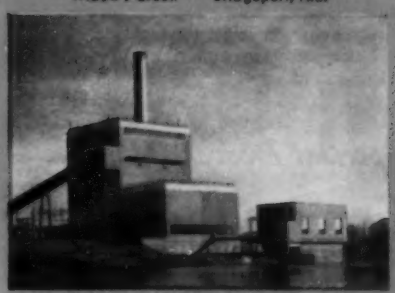
Southwestern Gas & Electric Co.
Lone Star Morris County, Tex.

Tennessee Valley Authority
Widow's Creek Bridgeport, Ala.

Utility
Southwestern United States



Texas Power & Light Co.
Rivercrest Red River County, Tex.



Wisconsin Public Service Corp.
Weston Rothschild, Wis.

A continuing B&W program of intensive research and development in combustion and steam generation, with the cooperation of the Nation's electric companies, has made possible many major advances resulting in more efficient production of electricity. B&W Units installed during 1954 represent an important part of the contribution toward lower cost power.

BABCOCK & WILCOX

BOILER DIVISION

C-774

Is high heat or humidity your cable application problem?

Selecting the right cable to meet specific application problems is often a task that calls for considerable discussion between customer and cable supplier. You know your operating conditions . . . and General Electric engineers at headquarters and in the field can help you select the right cable for these conditions. That's why we maintain a staff of wire and cable specialists to serve you at key points all over the country.

Here's how three G-E wire and cable specialists in different parts of the country recently answered important problems concerning cable applications involving high heat and humidity.

How can circuit maintenance costs in high-temperature applications be reduced?

"The life of natural rubber insulation is often drastically shortened when it must operate at the temperatures found in a steel mill. What's needed is a material that doesn't dry out and crack. My recommendation — G-E silicone rubber-insulated cable. Tests and field experience have shown that this insulation will operate in 400 F ambients. Even when it is directly exposed to flame, it burns gradually, forming a nonconductive ash. Therefore, circuits with damaged insulation can remain operative until cable can be replaced," . . . *L. F. Cudlin, Los Angeles.*

Is there a cable without metallic sheaths that is suitable for applications involving both moisture and high temperature?

"Applications involving high ambients and moisture are not a severe problem today, thanks to G-E silicone rubber-insulated cable. This cable has undergone prolonged water immersion tests—without lead sheathing—with no loss of electrical or physical properties. And it has excellent resistance to many oils, solvents and other chemicals," . . . *L. L. Young, Cincinnati.*

Can this new silicone rubber-insulated cable be used in existing conduit?

"It not only can be used in existing conduit, it can often be used to boost the capacity of existing conduit systems as much as 30%. Its conductor temperature rating is 125 C, compared to 77 C for cable with ordinary insulation. Moreover, G-E silicone rubber-insulated cable handles and installs just like ordinary rubber-insulated cable," . . . *P. N. Drew, Detroit.*

Of course there are many different environmental factors that can affect a cable installation. So, when you have an application problem, it's a good idea to give *your* G-E cable specialist the facts, and let him help you select the right cables for the job. Or write to Section W170-727, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Scientific tree care . . .

The Bartlett Tree Research Laboratories were established by the Bartlett Tree Expert Company in 1926 at Stamford, Connecticut. Here on a 200 acre experimental ground, ideas are tested and developed under actual growing conditions. There are indoor laboratories, too, for the study of insects and diseases which beset shade trees. In fact, it is a complete, down-to-earth laboratory for shade tree ills and ailments.

It is a place for Bartlett scientists to expand the research that already has initiated many innovations in tree care. One: the introduction of a complete, balanced, shade tree food fed through holes in the ground. Another: the successful control of one specific disease by use of chemicals introduced directly into the sap stream of the tree. Still another: developing an emergency sub-irrigation treatment with liquid food and conditioning chemicals introduced under high pressure.

This practical, scientific laboratory, in addition to its continual search for new ideas for the protection of shade trees, diagnoses the day-to-day problems encountered by our fieldmen. It is this that enables your Bartlett representative, with his knowledge of local conditions, to offer a service that is unique in the field of tree care. Call him today for a study of your tree situation. You will benefit by his recommendations.

REMEMBER

Our long experience in working with both utilities and the public is your assurance of dependable work and good customer relations.

The Bartlett Way

BARTLETT TREE EXPERTS

Home Office, Research Laboratories and Experimental Grounds, Bartlett School of Tree Surgery, Stamford, Conn.
Local Offices from Maine to the Carolinas, and West to Indiana.
See your Local Telephone Directory for Local Address.

New Current Transformer

"Do-It-Yourself" Kit Solves Stocking Problems

EXTRA LARGE OPENING of 600-volt through-type transformer makes possible easy conversion.

KIT CONTAINS insulated primary conductor, two primary bushing inserts, and two primary terminals with gaskets. Complete instructions make changeover easy.

New "do-it-yourself" kit converts a through-type 600-volt indoor-outdoor current transformer into a bar-type 5000-volt current transformer for either indoor or outdoor use. You get two voltage classifications, four possible uses from a single current transformer. The changeover is easy. Complete inserts and instructions come in a handy kit. You need only one unit in stock for two uses of two voltage classifications. Best of all, by using this kit on a 600-volt unit, you can cut cost of 5-kv metering.

Heart of this cost-cutting, stock-saving idea is Allis-Chalmers molded epoxy resin through-type 600-volt current transformer. It is available for 200-5, 400-5, 600-5 and 800-5 amp ratings, performing satisfactorily up to 200% continuous current. Its large opening is sufficient to take inserts that convert it for 5000-volt service.

Get full information on how you can take advantage of this completely new idea for cutting costs, saving on stocking. See your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wis.

A-4786

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

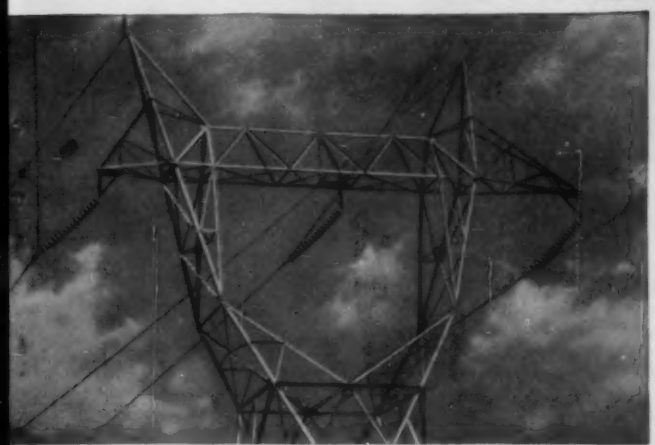
Transmission Towers

designed for heavy-duty service

The steel structural members of today's heavy-duty transmission towers are designed and fabricated with all the precision-engineering that goes into a skyscraper.

The skeleton-like frame of a transmission tower is *always directly exposed* to the ravaging effects of time and weather. In addition, the stress and strain to which your transmission towers are subjected are as changing as the weather. They must be strong enough to take the worst old Mother Nature can dish out. And *you* and your maintenance men should have *complete confidence* in the ability of the towers you specify or buy to "take it." Let the experience of the fabricator and the service record of the towers the company makes be your guide.

American Bridge has been designing and fabricating weather-worthy transmission towers for more than 50 years! *Furthermore, we're steel people.* And, as the world's largest fabricators and erectors of structural steelwork, we have the unquestioned know-how it takes to save you time and money in any transmission tower project. Our engineers welcome an opportunity to figure on your requirements. Just write our nearest office.



Recent high-voltage line towers
by AMERICAN BRIDGE

Appalachian Electric Power Co.	Cincinnati Gas & Electric Company
Ohio Power Company	Detroit Edison Company
Public Service Company of Indiana	Toledo Edison Company
Duquesne Light Company	Idaho Power Company
Dayton Power & Light Company	Indiana & Michigan Electric Co.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE · ATLANTA · BALTIMORE · BIRMINGHAM · BOSTON · CHICAGO · CINCINNATI · CLEVELAND · DALLAS · DENVER · DETROIT · ELMIRA · GARY MEMPHIS · MINNEAPOLIS · NEW YORK · PHILADELPHIA · PITTSBURGH · PORTLAND, ORE. · ROANOKE · ST. LOUIS · SAN FRANCISCO · TRENTON UNITED STATES STEEL EXPORT COMPANY, NEW YORK

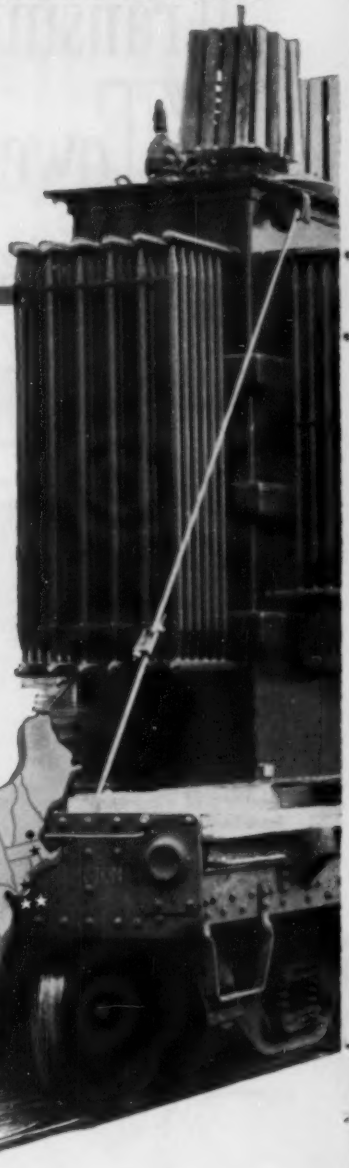
AMERICAN BRIDGE

USS

UNITED STATES STEEL

POWER TRANSFORMERS

. . . Another carload shipment of Kuhlman power transformers on its way! New Kuhlman design features protect them against damage in shipment. Quick Kuhlman service, too, on quotations and handling of your orders.

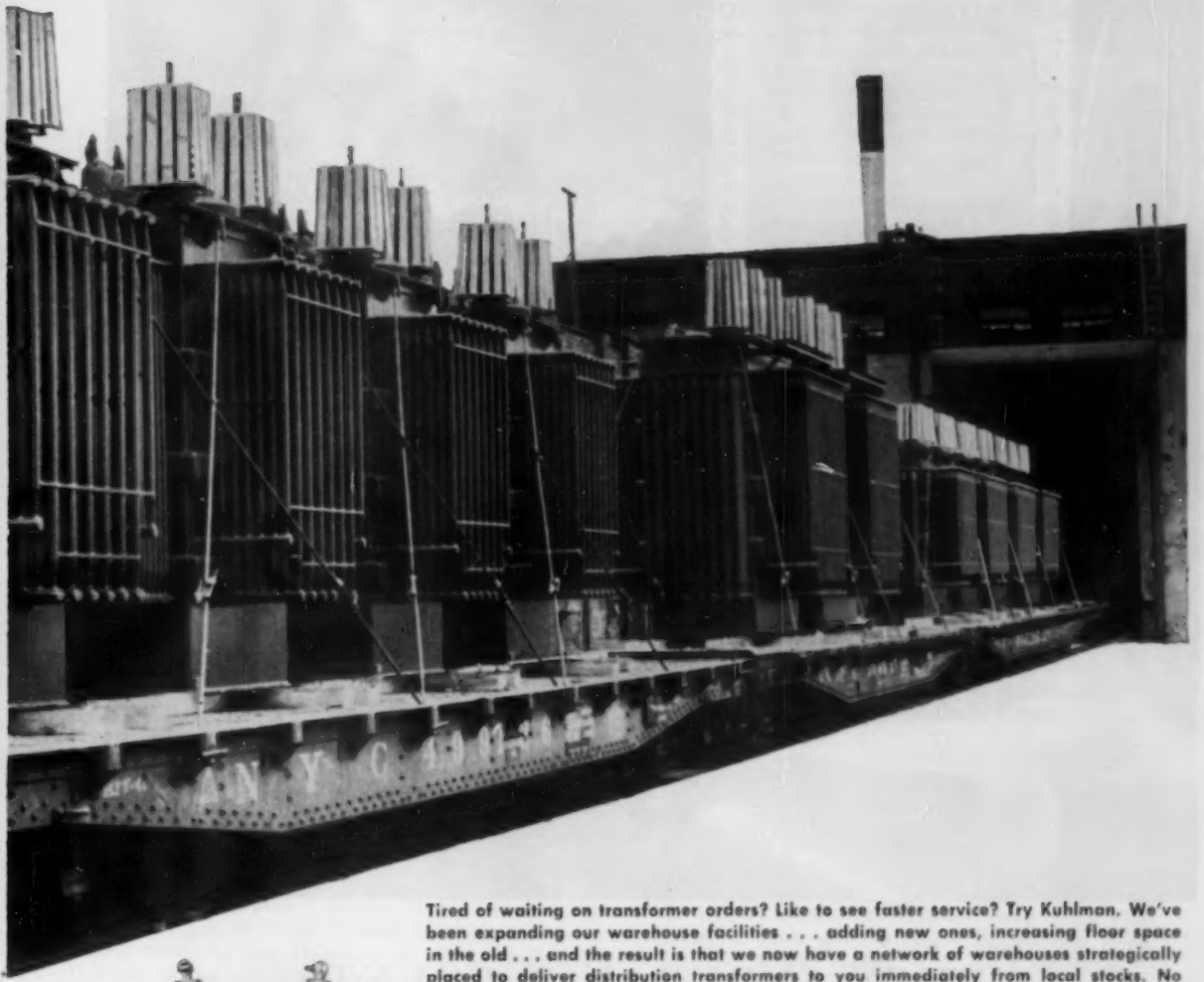


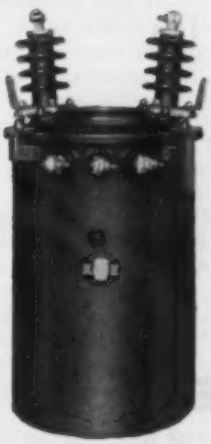
DISTRIBUTION TRANSFORMERS DIRECT FROM LOCAL STOCK!

There is a Kuhlman Sales Office and local stock in your area to serve you!

KUHLMAN ELECTRIC COMPANY

BY THE CARLOAD!





Tired of waiting on transformer orders? Like to see faster service? Try Kuhlman. We've been expanding our warehouse facilities . . . adding new ones, increasing floor space in the old . . . and the result is that we now have a network of warehouses strategically placed to deliver distribution transformers to you immediately from local stocks. No need to wait for shipments.

Another reason you'll like Kuhlman service is that we're small enough to avoid red tape and interdepartmental tie-ups. We're a compact group of specialists. Power transformer orders go into production at once, and our 63 sales offices can call direct to the factory any time a question crops up. We can give you greater attention . . . personal attention. And the same holds true for follow-up. Our sales and factory representatives, all experienced transformer engineers, will assist you in supervising the installation, testing, and putting into operation of your Kuhlman equipment. Factory guaranteed, your installation is backed by Kuhlman's 61 year reputation for quality products and friendly service. These are benefits you get regularly from Kuhlman.

The next time you need transformers, call your Kuhlman representative. We're sure you'll like our more personal service.

174

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

One of the great threats to the mythical Jason and the Argonauts as they sought the Golden Fleece was passage of their ship between the forbidding rock of Scylla and the whirlpool of Charybdis. With steady hands Jason guided the *Argo* safely through the treacherous channel. To this day, Scylla and Charybdis remain a symbol of perilous hazard.

WHEN ENDURANCE COUNTS

Overcoming the perils of Scylla and Charybdis, Jason and the Argonauts demonstrated great endurance in the face of severe destructive elements. Another—and more modern—demonstration of great endurance is Kerite Cable. Under every manner of adverse condition, throughout the world, Kerite Cable stands steadfast against all the elements which would destroy its efficiency. Kerite Cables, in perfect operating condition after 40 or more years, in hazardous original installations, is the rule, rather than the exception. The world over, the Kerite name is recognized as a symbol of ***durability***.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

Founded 1854

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

EDITORIALS

Your Stake in Better Lighting

You don't have to read between the lines of our special lighting roundup in this issue (p 91) to find that this base load is still the mainstay of the industry. Utility management, while vigorously pushing other load-builders, is taking a renewed interest in lighting both from the standpoint of load and load development.

Articles in this issue point to impressive reasons for the renewed interest: Consumers use 400% more light than they did in 1940, will go to 800% by 1965. Sale of large lamps is nearly twice the 1940 figure. The lighting load is double that of ten years ago. This means it is more than holding its own despite the advent of numerous, fast-selling appliances and equipment.

National organizations are pitching in with vim to help utilities exploit the various types of lighting loads. With national advertising, educational campaigns and all kinds of selling aids, such organizations as Edison Electric Institute, National Association of Electrical Manufacturers, and the Better Light Better Sight Bureau are giving a willing hand.

Some utilities are beginning to cash in on this boom in lighting. Cleveland Electric Illuminating Co has made a start with its marketing survey. Union Electric's Merrill E. Skinner is one of the sparkplugs for stepped-up promotion. Other utilities have a keen eye on the tremendous possibilities of lighting as a revenue builder.

But the lighting market is another one of those where each individual utility must "roll its own." National figures and the experience of other utilities may serve as general guides, but the individual utility must tote up its stake and the odds in its own lighting market.

To do this intelligently, the utility must find ways of collecting information on such items as:

- What part of the overall load is made up of lighting?
- How does lighting affect the system load factor?
- How does the lighting load compare with other loads as regards its distribution system requirements?
- What is the proportion of the various types of lighting as among industrial, commercial, and residential?
- What are the most effective means of going after the various types of lighting loads?
- How much can a utility afford to spend in going after new lighting business in each of the three main categories?

Some of this information is available from managerial experience within the utility. Some of it may be gained from engineering studies of data already collected for other purposes. But to secure a part of this information, sample surveys of residential and other customer groups may well be in order.

In our own studies we have found a lack of information of this type. That has also been the experience of others searching in this field. We know that lighting offers the promise of rich rewards in terms of revenue. It is up to each electric company to go after its proper share of that reward.

Watch the Small Things

"The more business I transact for my household with public utilities, the louder I hooray for private enterprise," says Columnist Bish Thompson of The Evansville (Ind.) Press. Along with a few other hot weather stories of the day, Thompson recently carried a story of his own experiences one moving day.

It was just an in-the-city move from Bayard Park Drive to a house on Akin Drive in Evansville. And like most of the rest of us, the Hoosier writer had to do a little juggling to keep utility service in the old house and try to get it going in the new one at the same time.

As he reports it, things couldn't have been better when he phoned the "light-gas" people. "All right, how may we serve you best? You want uninterrupted service at both houses? Certainly, just let us know when you want the meters read so we'll know how to bill both families." That was their response.

The "phone people" were just as agreeable.

But then it came to the water department, the trouble began. They had to have a deposit on the meter for the new house. And if he wanted the water to remain on in the old house for the new occupants, there would have to be an additional deposit for that.

As it ended up, Bish had to trudge down to the water department, plunk down a deposit on the new house, plunk down another deposit on the old house. Then, lo and behold, the "water people" turned the water off in the old house before the new occupants could move in.

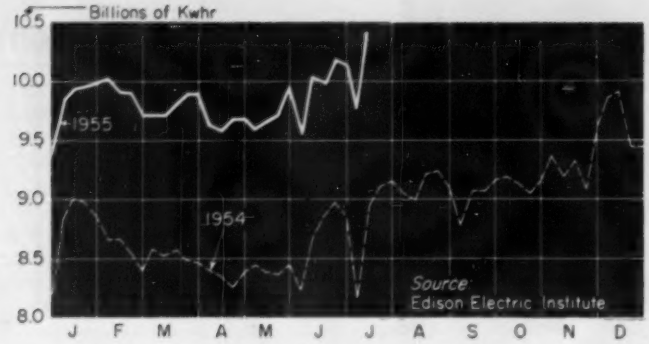
Now Bish didn't become incensed at the whole procedure. He knows there are pretty nice people down at the water department despite the snafu. He despises the inconvenience as most of us would on moving day, but charges the whole thing up to poor management practice.

We're not inclined to try to draw any profound lesson out of this experience. We know that a lot of cities handle the procedure with less inconvenience to the customer. All we say is that electric utilities should just try to prevent these nuisances for their customers so more people will keep shouting "hooray for private enterprise."

[Another electric company that is well aware of the public relations value of continuity of service when customers move is the Potomac Electric Power Co which serves Washington, D. C. A coming issue will carry an article describing its policy of not disconnecting service on such occasions. 'This has not only proved extremely popular with its customers but also is saving money for the company—The Editor.]

ELECTRICAL WEEK

LAST MINUTE



OUTPUT
Week Ended July 16
10,440,000,000 Kwhr
UP 16.6%

Atomic Energy Commission requirements — 888,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 11.3%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
July 16	+16.6	+10.8	+14.1	+29.5	+6.8	+22.4	+4.6	+11.7	+12.0	+5.8
July 9	+19.2	+15.0	+19.2	+34.8	+6.9	+25.3	+5.8	+7.8	+13.2	+4.8
July 2	+14.9	+10.3	+11.1	+22.8	+0.9	+20.5	+5.2	+11.4	+13.4	+6.8

Seasonally Adjusted Index 202.1 Week Ago 198.2 Year Ago 174.2

The Issue's Highlights: The GE submarine reactor at West Milton, N. Y., has delivered the first commercial atomic electric power through Niagara Mohawk Power's lines . . . New York Democrats close rift in ranks to support Senator Lehman's Niagara River power development bill . . . AEC's insurance study group issues its report; finds insurance industry can underwrite atomic installations . . . Rapid tax amortization program encounters policy differences in Congress . . . Highway construction bill in Congress provides aid for utility relocation expenses . . . A special report on lighting shows use of electricity in lighting is just now hitting its stride; predict 557% increase by 1965 . . . AIEE survey notes that system planning is getting real attention from utility management today.

West Penn Power Pres P. H. Powers announces company will build $35-million generating station at Reesdale on Allegheny River. First installation will be 165,000-kw unit scheduled for completion in 1958. It will bring West Penn Electric system capability to 1.9 million kw.

Missouri Governor Donnelly has vetoed legislative bill which would have weakened state's public utility anti-strike law by stripping it of most of its stringent penalty provisions. Labor has been seeking repeal or modification of the law since its introduction in 1947. Since adoption of law, said Donnelly, state has been able to protect "public right to uninterrupted service" by public utilities.

Plans and Starts: California Oregon Power has placed in service Lemolo No. 1 generating plant's 29,000-kw unit on North Umpqua River . . . TVA has put into operation 180,000-kw first unit of John Sevier Steam Plant, bringing TVA total steam capability to 7,989,985 kw . . . Manitoba Hydro Electric Board has completed era of hydro development in province with opening of its new 60,000-kw unit at McArthur Falls on Winnipeg River. This was last available hydro site on the Winnipeg. Board will turn now to steam power development . . . Sacramento Utility District will seek FPC license to build three power plants in District's proposed Upper American River Project. Combined capacity will be 160,000 kw.

About $27 million will be available to Bonneville Power Administration this fiscal year for completion of current transmission projects and new starts, said Administrator W. A. Pearl. Total funds for building come from $14.6-million construction appropriation and over $12 million in carryover and reimbursements . . . Pacific P&L may build $50-million steam generating plant in Wyoming to supply power needs of Wyoming utilities and aluminum reduction plant proposed by Reynolds Metals, according to W. O. Johnston, vice president.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Off the Washington Wire: House Public Works Committee has approved $48.5-billion highway bill. It provides for reimbursing utilities up to 50% of costs for relocating utility facilities (p 79) . . . House Rules Committee has killed Senate-passed move to initiate $3-million Passamaquoddy Bay power study.

Memphis now is thinking in terms of two steam generating plants to develop ultimate capacity of 1.5-million kw. Thomas S. Allen, head of City's Light, Gas, and Water Division, says generating units for these plants will be 125,000 to 250,000 kw. Allen hopes for initial capacity of "500,000 kw, if possible" in first plant Memphis starts. But he wants "two plants coming along at same time."

Dixon-Yates: Sen Estes Kefauver's Senate anti-monopoly subcommittee continued its digging into Dixon-Yates contract last week with these results: **1.** Presidential Assistant Sherman Adams has been invited to testify. It had been disclosed previously that Adams had called for the suspension of the SEC hearings on Dixon-Yates financing. **2.** Sen J. C. O'Mahoney (D-Wyo.), a Dixon-Yates opponent, told Kefauver he would not "get to first base" with a criminal indictment of Adolphe H. Wenzell of First Boston Corp who had been financial adviser to Budget Bureau. **3.** First Boston's Chairman George D. Woods testified that he offered his services to Budget Director Joseph Dodge in 1953. Meanwhile, Administration is studying possibility of negotiating settlement of Dixon-Yates contract outside cancellation provisions because of legal confusion over these provisions. Confusion is said to stem from fact cancellation clauses do not cover circumstance under which contract is being killed. Dixon-Yates group ceased all work on project July 13.

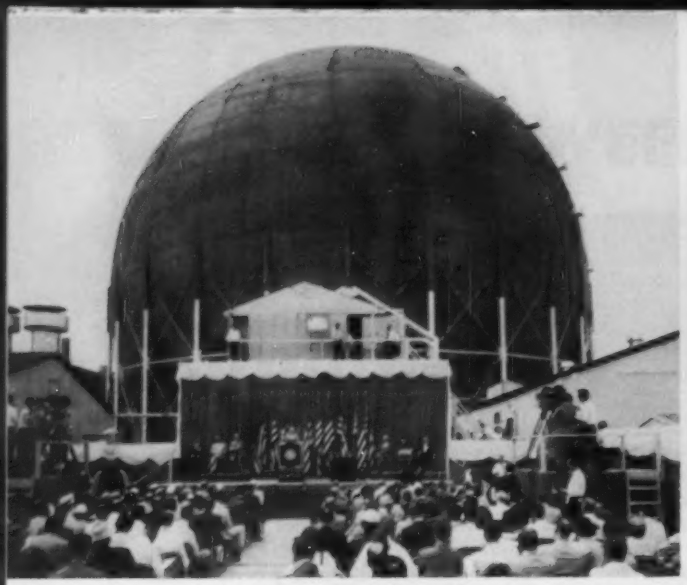
Marianna, Ark., which gets its power from Arkansas P&L, is studying plans to build its own city power plant . . . Frontier Power Co has asked Colorado PUC to approve sale of Frontier to two co-ops and municipality of Walsenburg, Colo., for $2 million . . . Central Vermont PS has postponed plans to build hydro plant at East Georgia until differences with Vermont Electric Co-op can be resolved. CVPS owns site and most of flowage rights but co-op is seeking FPC license to develop site. CVPS Pres A. E. Cree says company has protested to FPC.

ABOUT PEOPLE IN THE INDUSTRY

AEC Commissioner Willard F. Libby thinks industry is overlooking a promising nuclear power reactor. He said recently: "I was personally very disappointed to see that none of the proposals we received on April 1 included . . . the homogeneous type of reactor which I believe is likely to give us the cheapest power, at least in large quantities at stationary power plants." If industry did not come up with a proposal for this type of reactor, Dr Libby added, he would favor government's going ahead on its own.

Differences over Niagara power development will result in ouster of Robert Moses as chairman of New York State Power Authority, Rep William E. Miller (R-N. Y.), who is backing private development, told Senate Public Works Committee. Governor Harriman would then bring in Charles Poletti to replace Moses, and former FPC Chairman Leland Olds as a member. In case of latter, Miller added, "there would be imposed upon people of my state a man . . . (formerly) unanimously rejected for reappointment to the FPC."

More News About People page 186



At ceremonies by steel sphere housing reactor . . .

Lewis Strauss throws switch to deliver . . .

First Commercial Atomic Power

The first commercial atomic electric power to be produced for sale to the public was generated at West Milton, N.Y., last Monday at 2:57 pm and sent out over the lines of the Niagara Mohawk Power Corp.

Steam produced by the Atomic Energy Commission's land-based submarine intermediate reactor was used to drive a 12,500-kw turbine generator installed and operated for the purpose at no expense to the government by the General Electric Co.

Chairman Lewis L. Strauss, of the AEC threw the switch which sent atomic electric energy out into the system of the upstate New York utility.

Under the arrangement between the AEC and the Niagara Mohawk Power Corp, 10,000 kw of "dump" power, enough for a city of 20,000 is being sold to the utility at 3 mills per kwhr. The price was set by AEC after consultation with the Federal Power Commission and others.

The submarine reactor at West Milton, which is supplying steam to the turbine generator was designed and built at the AEC's Knolls Atomic Power Laboratory by GE. It is a prototype of the reactor installed in the submarine Sea Wolf which was scheduled to be launched last week at Groton, Conn.

First to use neutrons in the "intermediate" energy range, the so-called submarine intermediate reactor (SIR) uses liquid sodium to transfer heat to a heat exchanger where it converts water to steam to drive the turbine.

The land-based prototype of the submarine reactor is housed in a 225 ft. steel sphere weighing 3,850 tons that rises higher than a 16 story building. Purpose of the sphere is to "contain" radioactive by-products in the remote event of an accident to the reactor.

Strauss: We're at the beginning

In marking the occasion of the generation of the first commercial atomic energy, Admiral Strauss said, "We are just at the small beginning of trying to apply the great energy of atomic reaction, but our program should be vastly accelerated by our accumulated knowledge. . . ."

"American companies, and groups of companies," he said, "stand ready to build six commercial atomic power plants with a total capacity of 765,000 kw and have them completed within the next five years at a total cost of nearly $250 million." Some of these groups are prepared to pay the entire cost out of their own pockets without financial help from the Federal government, even though atomic power plants are not a paying proposition, Strauss said.

Ralph Cordiner, president of GE, whose company spent an estimated $1,250,000 for the power plant at West Milton said, "This historic step takes the free world over the threshold of the atomic-electric age and puts the limitless energy of the atom in the service of mankind."

Sen Clinton P. Anderson, (D-N.M.) chairman of Joint Congressional Atomic Energy Committee, told those attending the dedication that many knotty technical problems require solution before power reactors of advanced design can be built. "It could be said," he added, "that large sums of money must be risked if we are to construct large scale power reactors with private funds. But ingenuity, boldness and risk-taking are the very foundations of the economic system which has made our nation prosperous and great."

"The goal now stands clearly above the horizon," Senator Anderson said, "but it will not be reached quickly without renewed dedication—and still greater ingenuity, boldness, and willingness to sacrifice. It is through a team effort of government and industry—with each partner taking on the responsibility it is best prepared to assume—that this goal can be reached most quickly," Senator Anderson said. "Above all, the goal of commercially practical atomic power will be most quickly reached if we pursue it with all the skill, all the ingenuity, and all the daring and resources our free enterprise system can muster", he added.

The GE atomic power plant was built according to a contract made with AEC and is expected to operate for the next 2½ years. Construction of the turbine generator portion of the plant was by the Bechtel Corp, San Francisco, Calif.

State Development of Niagara Pushed

- **New York Democrats end dispute, rally behind Lehman's bill in Congress**
- **Utility Leader Earle J. Machold presents the case for private development**

A recent realignment of New York State Democratic forces, closing up a rift in their ranks, has strengthened public power advocates in their fight for Congressional approval of the State Power Authority as builder-operator of the $400-million Niagara River hydro project.

With time for Congress' adjournment drawing near, the big public-power push probably will not come until early next year. But the change in the Congressional line-up strongly indicates that a determined spearhead will develop on the Niagara issue.

Five New York private utilities supplying 92% of the state's needs have made their pitch for the right to the one-million-kw installation approved last year, and they've had powerful Republican support in Congress.

Until recently, the utilities have been aided greatly in this effort by a split in Democratic ranks. Some Democrats have been backing a bill by Rep Charles A. Buckley (D-N.Y.) to let the Federal Power Commission decide who should build it, and others have stood behind Sen Herbert H. Lehman's (D-N.Y.) proposal to authorize the New York State Authority to take it on.

Support for Lehman

Conflicting groups in Congress have decided to combine their strength in opposing the private companies' efforts. Buckley has backed off, and he is lining up his supporters behind Lehman's plan. If it looks as if they've been successful by early next year, extreme pressure will be brought to bear to get fast action on the Lehman proposal.

As of right now, Democrats on the Senate public works subcommittee, which is considering the legislation, believe they have won. They're confident of at least a 4-3 margin in favor of Lehman. This group ended its hearings last week.

On the House side, private forces probably will do better, but they are still afraid they lack the necessary votes to beat the Power Authority bill. They figure they can't marshall more than enough for a 17-17 tie in full committee. They're not nearly as

E. J. MACHOLD

far along as the Senators, however, because they've been bogged down for more than a month on multi-billion-dollar highway legislation.

If the Lehman bill passes the Senate, House private power supporters will have even a tougher time putting across their argument.

Bridging the split in Democratic ranks marks the first break in a long stalemate between the two political parties. They've held each other off for almost two years, with the Republicans unable to gather up enough strength to put across their plan even when they controlled Congress. This was because the Democrats, although split on their own proposals, were almost solidly against the private companies' plan.

When the Democrats took hold this year, it seemed the State Power Authority stood a better chance with the Lehman bill, but the split deepened and held things up for months.

An interesting development in the fight among the Democrats was this: New York State Power Authority Chairman Robert Moses, who is pulling for his unit to get the project, is reported to have been told to stay out of the fight while Congressional Democrats tried to heal their schism. He did go along to the extent that he passed up the opportunity to testify before the Senate group. But he sent a letter to the Senate Committee to state his side for the record.

This breach of party discipline apparently irked New York's Gov Averell Harriman, a Democrat who nevertheless, has to try to please everybody to stay in office. It is reported that Harriman may fire Moses because of the letter.

During the last long day of the Senate subcommittee's hearings, the private power companies presented their case.

The Utilities' Case

Earle J. Machold, president of Niagara Mohawk Power Corp, testified for his firm, as well as for New York State Electric & Gas Corp, Rochester Gas & Electric Corp, Consolidated Edison Co of New York, Inc, and Central Hudson Gas & Electric Corp. These five companies, he said, serve a 44,000-square-mile area containing 14 million people — 90% of the state's population and 90% of its area. He made several significant points:

- The companies are ready, willing and able to market Niagara power without the help of one cent of any taxpayer's money or tax subsidy.
- The project is not in any sense a multi-purpose development—the usual basis for undertaking to make federal projects public in nature throughout. He pointed out that Army Engineers had testified that no pollution control or flood control problem would be introduced; he said the entire project would be built simply for production of power.
- Private enterprise now pays some $1.9 million a year for use of water in the existing hydro development and has paid to New York State so far over $25 million in water rentals. If private enterprise makes the additional development at Niagara Falls, the annual total paid to the state for water rentals would be about $5 million a year, he said.
- While the development represents an important addition to the state's power supply, its potential of some one-million kw of dependable capacity is only a fraction of the present installed capacity of eight-million kw in the state, or even of the five companies, which have a total of 7.4

million kw capacity.

The project, Machold pointed out, would not relieve the five utilities of the necessity of providing additional generating capacity to meet growing loads—they spent $170 million to add and improve facilities in 1954, and they plan to spend as much this year. They'll put in about one million more kilowatts of capacity before any power comes in from the Niagara development.

The National Association of Manufacturers also appeared at the final Senate subcommittee hearing. Robert R. Balmer, vice chairman of the NAM Committee on Conservation of Renewable Natural Resources, said private development would pay the government more than $20 million a year in taxes, and public development would result in "inescapable hidden deficits." His testimony was similar to that submitted by the U. S. Chamber of Commerce, which estimated the companies would pay New York $3 million a year for water rights.

Peacetime Atom Is Insurable

. . . says group of insurance executives in their interim report to AEC; more time needed to study experimental installations

A study group of ten top-level private insurance executives has indicated that something can be worked out to provide adequate insurance coverage for industrial atomic liability.

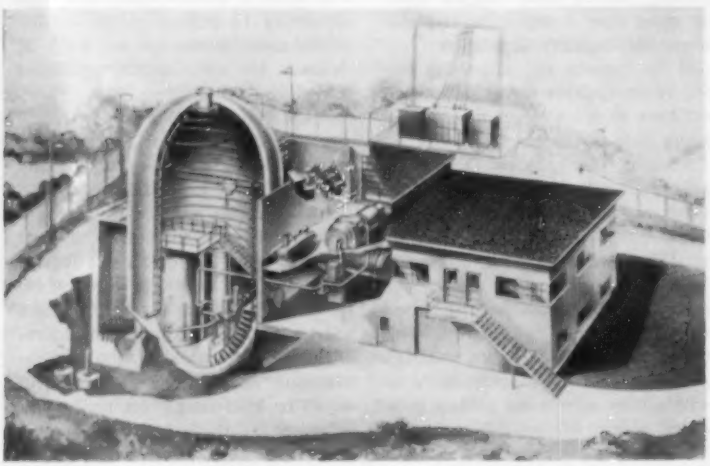
After a four-month study, the group has submitted an interim report to the Atomic Energy Commission. It wants more time to study the problem, particularly because of the experimental nature of atomic installations which will need coverage in the next few years. In view of this, it calls its conclusions "interim."

These are some of the highlights of the group's report:

- Potential atomic catastrophe, although remote, is the most serious thing yet encountered in industry.
- Insurance capacity for physical hazards of chemical operations seems adequate to cover reactor plants. This would, of course, include commercial nuclear power plants. But apparently even nuclear power plants are felt to be so potentially hazardous, from an insurance standpoint, that the number of firms capable of underwriting their risks is limited. Although power plants probably rank among the safest atomic installations, hazards to nearby industrial plants could be great enough to push needed coverage beyond the capacity of the insurance industry.
- Public liability hazards from reactors can be insured by existing insurance facilities up to the limits of liability normally available to more hazardous industrial enterprises.
- Insurance against loss of use, frequently purchased in connection with boiler-damage insurance, presents such a difficult problem during early development of atomic power that any such protection will be limited.
- Physical damage losses to reactors and machinery can probably be handled in the same way that boiler coverage on extra-hazardous machinery is now handled in other industries.
- Workmen's hazard compensation for employees operating reactors and auxiliary equipment can be handled.
- The most serious problem as to the amount of insurance available lies in the field of third party liability insurance. Claims, in event of atomic catastrophe, might be made directly by the person suffering injury or arise as subrogation actions on the part of insurers called on to pay the loss in the first instance.

Nevertheless, the committee had this to say of third-party liability: "Notwithstanding these complications, it is believed that the insurance industry can work out an aggregate limit of liability for all parties at interest substantially equivalent to that normally required by other major enterprises."

This hopeful note on all types of coverage also was sounded: "As knowledge of the basic hazards involved increases, the insurance market should be expected to increase its capacity."



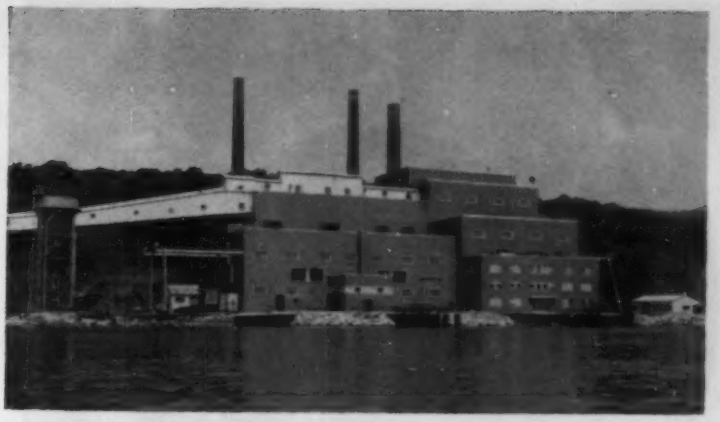
Engineering Work Underway on . . .

Army Package Power Reactor

Engineering work on a package nuclear power plant, which can be disassembled and transported by air, is reported well underway.

The Army Package Power Reactor, shown in cutaway sketch above, is expected to operate at full capacity for 18 months on a small fuel charge. The reactor and the steam generator are housed in a 36-ft by 64-ft vapor-tight steel sphere which could be connected to any steam generating plant in an emergency. Only available water supply and boiler pressures would limit its use.

Alco Products, Inc, recently announced that Stone & Webster Engineering Corp had undertaken the engineering-construction of the reactor scheduled for operation in 1957. Once installed at the Army's Engineering Research and Development Laboratory at Fort Belvoir, Va., the package plant will be used in normal post operations. Steam from the plant will feed a nearby turbine.



Rockland L&P Completes Lovett Plant

Activation of a 70,000-kw generating unit at Rockland Light & Power Co's Lovett Plant at Tomkins Cove, N. Y., on Hudson River recently marked the end of an eight-year, $25-million construction project. The new unit, third and largest to be installed at the plant, boosted Lovett's total capacity to 118,000 kw. The plant was named for Fremont L. Lovett who served for 26 years as general manager, vice president, director, and president of the company. Addition of the new unit was celebrated with a four-day open house.

Fast Tax Write-Off Snarled

The future of accelerated tax amortization for electric utilities and other defense-related industries is tied up in a government policy squabble.

The controversy comes on the heels of a recent Office of Defense Mobilization decision to hike the electric power expansion goal to 150-million kw by the end of 1958. This was a green light for five-year tax write-offs for 34-million kw of new capacity.

Right now, there are conflicting top-echelon views in Washington on what should happen to the fast write-off program. The Defense Mobilization Board, a cabinet group set up for policy making, is considering the matter.

Many industries—notably electric utilities and steel—want more rapid amortization. Benefits under the program so far are running out; tax liabilities are starting to rise.

The battlegrounds:

ODM wants the program continued. In fact, it's been considering boosts in other industry expansion goals—steel, aluminum, oil refining, and commercial aircraft. The agency's view is that rapid amortization is the government's least costly incentive for defense plant expansion, and that considerable expansion must still be made in the nation's mobilization base.

Some of the government's defense claimant agencies—Interior Department (for electric power and petroleum) and Commerce Department (for several manufacturing industries)—support ODM's position.

On the other side of the fence stands Treasury Secretary George Humphrey. He is firmly against new rapid amortization goals and wants to halt the program as it stands now.

Treasury's view is that too much tax revenue is being lost—or at least deferred—because of the fast tax write-off. This is particularly serious at the present time, the department says , because defense spending is still high and a balanced budget is becoming a tougher nut to crack.

Speaking to the House subcomittee on legal and monetary affairs last week, Humphrey cited recent tax changes as a reason to curtail the write-offs. When write-offs were instigated, he pointed out, the excess profits tax, by taking 82% of corporate business profits, discouraged large expenditures for expansion.

Repeal of that tax in January 1954, he observed, reduced the need for the write-off program.

Treasury estimates that 1955 will be the peak year of tax deferments under the defense amortization program and that the figure will come to $980 million. It figures there has been a totaf of $3-billion worth of tax deferments up to now from write-offs.

The mobilization officials, however, pooh-pooh the $980-million figure. As they see it, the government will spend $29.4 million to borrow money at 3% in place of the deferred taxes. Yet, if private industry earned only 5% on its investment and paid out 50% in taxes, it would take only $1.2 billion of investment to generate $30 million in taxes.

While it's really impossible to estimate how much new investment has been stimulated by the spur of fast tax amortization, it's a certainty that the figure topped $1.2 billion. So, the mobilizers' argument goes, it's a sure bet that the interest expense to the government on the deferred taxes is offset by increased tax revenue from the new investment.

But ODM's main contention is that defense facilities—from electric power to steel mills—have been built up tremendously since Korea with private capital, and that the only cost to government has been the deferment of tax payments.

Future Outlook

Washington expects to come up with a final decision on the fast tax write-off's future some time next month. Right now, the outlook is this: Tax write-offs will be continued as a defense measure, but their scope will be cut back substantially. In no case, though, will five-year write-offs already granted be disallowed now. But it's unclear how a cutback in the program will effect the unsubscribed portion of the recent 34-million-kw hike in the electric power expansion goal.

Latest government statistics show that over 659 new or expanded electric light and power projects, worth more than $4.2 billion, have been certified for accelerated tax amortization. As of October 1, 1954—the latest information available—$3.5 billion, or 83%, of this expansion was already in place. But only 442 projects, costing $1.4 billion, were completed.

On the electric power expansion, $1.2 billion has been invested in construction, land, and overhead, and $3 billion in machinery and equipment. The power projects make up about 14.6% of all the industry expansion so far covered by fast tax write-offs.

WASHINGTON CHECKLIST

TVA Bonds—Hearings on Tennessee Valley Authority revenue bond bills have been abandoned in the House for this session. However, they've started in the Senate. TVA witnesses included Chairman Vogel, Power Chief Wessenauer, and former Counsel Swidler.

Atomic Ship—The House, which has already rejected President Eisenhower's proposal for an atomic-powered "show boat" to tour the world, has voted legislation for a commercial-type passenger-freight atom vessel. It would cost upwards of $30 million. Meanwhile, the Atomic Energy Commission launched its second atomic submarine, the Sea Wolf.

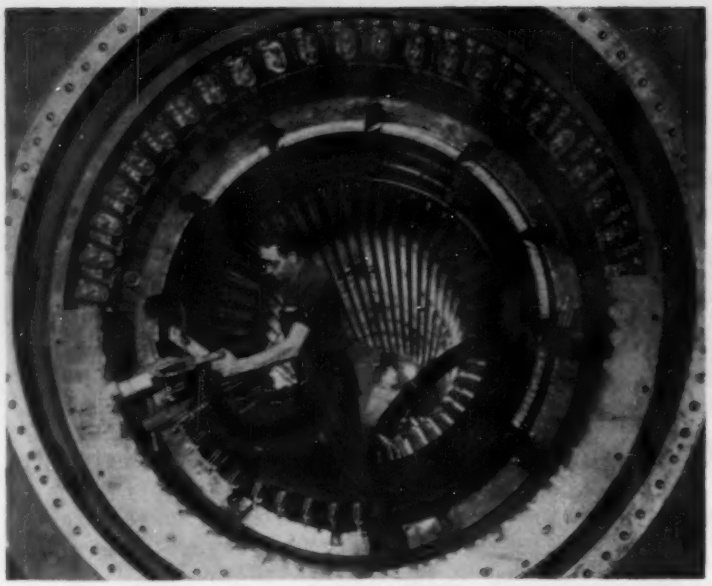
Trinity Project—Senate subcommittee, in a one-day hearing, was told by Assistant Interior Secretary Aandahl that the Department favors non-federal construction if a contract can be worked out. Chances of action this session are improving. If Trinity is voted, Chairman Engle (D-Calif.) of the House Interior Committee will withdraw opposition on the House floor to passage of the Upper Colorado bill. His committee's report on that bill noted that a partnership offer by Colorado-area utilities "seemed entirely reasonable to the Committee."

Passamaquoddy—House Committee reported a bill authorizing study of the project.

Public Works Appropriations—The President signed a $1.36-billion public works appropriations bill containing money for AEC and federal power agencies for fiscal 1956. AEC gets $575 million in new money; TVA gets $37.5 million; Army Engineers get $544 million. New projects authorized for the Engineers and Reclamation Bureau have an ultimate cost of perhaps $1.5 billion. Bonneville Power Administration got $14.6 million, plus $12 million carry-over, for transmission line construction.

Atomic Energy—AEC announced $350,000 contract for Foster Wheeler Corp to design and build a research reactor at Livermore Research Laboratory, Calif. Competing proposals from other groups such as GE-Kaiser, Vitro-Avco, North American Aviation ranged from $705,000 to $908,000.

Hells Canyon—House Interior Committee rejected, by party-line vote, a Republican move to postpone indefinitely action on a bill to authorize a $350-million federal high dam. This leaves open the possibility of action on the bill this session.



GE Building Largest Liquid-Cooled Unit

The first large generator with a liquid-cooled stator is nearing completion at General Electric Co's Large Steam Turbine-Generator Plant, Schenectady, N. Y.

The new 260,000-kva unit, to be installed at Cleveland Electric Illuminating Co's Eastlake Plant, has been heralded as a major step in the development of large-capacity generators. GE has announced that more efficient heat removal, by circulation of the liquid coolant through hollow windings in the stator, makes possible a significant increase in the capability of generators without increasing physical dimensions.

Three conventional hydrogen-cooled generators, each rated 125,000 kw, have already been installed at CEI's Eastlake Plant.

House-Slashed AEC Fund Taken Up by Senate Unit

The Senate Appropriations Committee began hearings last week on a House-stripped supplemental money bill to finish fiscal 1955 business for the Atomic Energy Commission. The Senators sought to repair some of the damage which the bill had suffered in the House.

When the bill hit the Senate group, it contained only $166 million for AEC—$144.4 million short of the amount requested by President Eisenhower. The slash resulted from a parliamentary hassle which began in the House Rules Committee over language prohibiting expenditure for a Tennessee Valley Authority transmission line to the Dixon-Yates plant, then still being planned.

When the bill reached the House floor, tempers flared, and, in the rumpus, the bill was ripped to shreds.

INDEX

Bound into the back of this issue will be found the regular Electrical World index for the six months January-June. In the past, this index has been made available as a separate document.

Relocation Aid Provided . . .

. . . in highway bill now going through Congress, but amount of federal share limited to 2% of total highway project cost

Utilities will get some help in relocating lines that have to be moved under the multi-billion dollar highway construction bill now going through Congress—but not as much as expected.

The House Public Works Committee, while working out a bill that received Administration approval, made some changes from the recommendations contained in the bill voted by the Senate and in the original bill drawn up by Rep George H. Fallon (D-Md.). The original plan would have required the federal government to pay half the cost of relocating lines that had to be moved; this would be effective in those states that do not reimburse utilities for such relocation.

But under the bill, as it was taken up by the House last week, any such payment would be left up to the discretion of the Secretary of Commerce. The legislation says that the federal government could pay up to 50% of the cost if the state requested this and if the federal officials approved—but such payment could be no more than 2% of the total cost of the particular project. The 2% limitation is in the Senate legislation.

Bureau of Public Roads has figures showing that total cost of relocating all kinds of utility lines during 1953 amounted to more than 2.5% of the $1.7-billion spent in road-building. Of the estimated $35.5-million expenditures by companies reporting to BPR, only $8.5-million was reimbursed; expenditures by non-reporting companies would bring the total up to an estimated $45-million.

Final outcome is of importance to utilities, since the new program would step up highway construction—and relocation costs—tremendously. During the five-year period, 1950-55, construction on federal-aid highways averaged only about $1.4-billion per year. Under the new program, such construction for a 12-year period would average almost $4-billion per year.

As EW went to press, controversial tax features had delayed the bill in Congress. But relocation cost provisions were undisputed.

State or Private Line Issue Up to Harriman

New York State Gov Averell Harriman will have to decide whether State Power Authority or private utility transmission lines will carry 145,000 kw from the St. Lawrence power project to three customers.

State law prescribes that the Power Authority must use existing private utility transmission lines, if obtainable at reasonable rates, to deliver the 145,000 kw to the State of Vermont, the City of Plattsburg, N. Y., and Plattsburg Air Force Base. The Authority, headed by Robert Moses, put it up to Governor Harriman to make the decision.

Public power advocates insist that the Authority build and use its own lines. However, there is a strong possibility that private utilities would try to invoke the state law to halt Authority construction.

Plan Million-Kw Station

Plans to build a power plant of ultimate 1,000,000-kw capacity on the Delaware River south of Portland have been disclosed by Metropolitan Edison Co of Reading, Pa. A 165,000-kw steam generator, costing $25 million, will be the first unit installed at the Delaware station.

Changes in Capacity Reported to FPC

PLANT ADDITIONS DURING MAY

State	Utility	Plant	Fuel	Capacity (Kw)
N. H.	Public Service Co of New Hampshire	Schiller	S	40,000
Ind.	Indiana-Kentucky Electric Corp	Clifty Creek	S	200,000
Ill.	Illinois Power Co	Vermillion	S	60,000
Ill.	Illinois Rural Electric Co	Pittsfield	IC	2,745
Mich.	Consumers Power Co	Weadock	S	156,250
Wisc.	Oxford Light & Power Co	Fairwater	H	75
Wisc.	Columbus Water & Light Dept	Columbus	IC	1,420
Minn.	Benson Water & Light Dept	Benson	IC	1,250
S. D.	Northwestern Public Service Co	Portable	IC	500
Kans.	Stockton Electric Dept	Stockton	IC	1,360
Va.	Monongahela Power Co	Monterey	IC	100
N. C.	Nantahala Power & Light Co	Tennessee Creek	H	10,800
Tenn.	Tennessee Valley Authority	Kingston	S	180,000
Okla.	Oklahoma Gas & Electric Co	Mustang	S	100,000
Tex.	Central Power & Light Co	Laredo	S	33,000
Idaho	U. S. District Engineers	Albeni Falls	H	14,200
Wyo.	National Park Service	Lake	IC	300
Wyo.	National Park Service	Old Faithful	IC	212
Ore.	U. S. Army Corp of Engineers	Dexter Point	H	15,000
Calif.	Southern California Edison Co	El Segundo	S	156,250
Calif.	Bureau of Reclamation	Folsom	H	54,000
Calif.	Bureau of Reclamation	Nimbus	H	6,750

RETIREMENTS

Me.	Central Maine Power Co	Bar Mills	H	1,600
Ohio	Ohio Power Co	Findlay	S	5,000
Mo.	California Electric Dept	California	IC	240
Md.	Eastern Shore Public Service Co	Oxford	IC	100
Va.	Virginia Electric & Power Co	Chesterfield	IC	200
Wash.	Bureau of Reclamation	Prosser	H	2,400

U. S.	Hydro	Steam	IC	Total
Added	100,825	925,500	7,887	1,034,212
Retired	4,000	5,000	540	9,540
Adjustments Plus	4,100	.....	3,000	7,100
Adjustments Minus	.....	9,080	3,059	12,139
Net Change	100,925	911,420	7,288	1,019,633

H—Hydro, IC—Internal Combustion, S—Steam
United States Capacity as of June 1—Hydro 23,894,802 kw; Steam 80,118,423 kw; IC 2,311,053 kw; Total 106,324,278

Consumers Power will link offices by tunnel with . . .

MANAGEMENT—Planning

New Underground Control Center

In a double move to strengthen power dispatching security and to relieve general office operations from mid-city congestion, Dan E. Karn, president of Consumers Power Co, has announced two major projects of statewide importance to system operations.

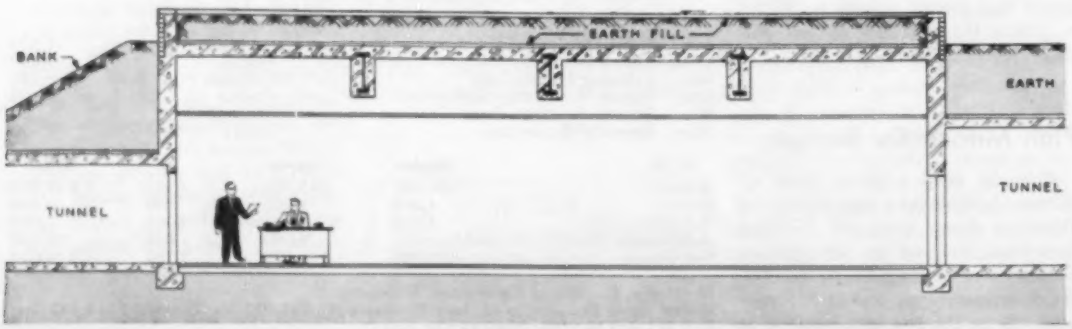
Immediate construction is scheduled for a new general office building northwest of Jackson, Mich., headquarters city for electric operations reaching 1,480 cities and smaller communities in state of Michigan.

At the same time, work is being started on what is said to be one of the nation's first power control centers, exclusively engineered for underground, as a self-contained and self-sustaining facility, remote from the center of a city or populous area.

The structures will be built on a 71-acre site purchased by the company three years ago for growth purposes, and located several miles from the center of Jackson, Mich.

The new underground control center will cover an underground area of 4,250 sq ft. It will be of solid reinforced concrete with a roof structure of 10-in. steel beams encased in concrete and capable of operating in a sealed-in condition if an emergency arises. The depth below ground level to the working floor is estimated at about 14 ft.

The design includes a self-contained



Cross-section of underground control center outside Jackson, Michigan

Electronic controls, 14 ft underground, can operate on battery power

air supply and ventilating system, internal water supply, battery-powered electric generator for emergency power for instruments, communications and lighting, and emergency canteen facilities.

Control circuits for telephone dispatching of power operations, telemetering and special automatic controls will extend underground from the center to a point some miles away.

An emergency exit will reach to ground level, and an underground tunnel will extend from the control center to the new decentralized general office building. While offering no observations on any "bomb shelter" aspects of the center, the engineers have stated that the structure will be "strong enough to support the main office building if it were to fall on it."

This underground power control installation will be the nerve center for the company's statewide integrated power system, embracing more than 5,000 miles of transmission lines and 34,000 miles of distribution lines, reaching across 29,000 sq miles of urban and farm territory.

From the control center, dispatchers are in continuous contact with regional dispatchers and the interconnected electric system, which includes five major steam power plants, eight major hydro plants on four rivers, and numerous smaller steam and hydro stations, totaling more than 1,500,000 kws. Power output in excess of 7-billion kwhr flows over the system in a year's time.

Power control cummunications range from direct telephone circuits linking plants and major switching or substations, to so-called "wired wireless" or guided radio, and automatic "tele-control".

In this development in the art of power control, electronic impulses from the central control point reach directly to generating units hundreds of miles apart, and by actuating the steam turbine throttles, compensate instantly for changes in power load on the system and maintain the correct ac frequency vital to the operating of thousands of customers' motors and other electric devices. This automatic control as now programmed applies to more than 1.20 million kw in power plant units operating and under construction.

Hundreds of mobile radio-telephone units are also in use for contact in the field and for impressing into emergencies throughout the state.

The general office building will be of modern design, featuring luminous ceilings, and moveable steel, plastic-coated walls. The exterior design incorporates glass, stone, brick and metal panels. It will be air conditioned.

An auditorium with advanced lighting equipment, and special meeting rooms will be built into the general layout. These will provide for employee meetings, home-making and other sales-building demonstrations for customers and the general public.

In the initial planning, five general departments with about 450 of the company's approximately 1,500 general office employees, will be located here. These are electrical engineering, electric distribution, production and transmission, general construction and land and title departments.

"The relief of our downtown facilities will enable the Jackson division organization to occupy much needed space and provide more room for other general departments," said Karn. In citing the problems of growth, Karn pointed out that since 1945, total customers have increased over 395,000 to a present figure exceeding 1,170,000.

NEWSMEN WEAR LIFE JACKETS AS SMALL BOAT TAKES THEM INTO MIDSTREAM TO VIEW DIAMOND DRILL BARGE

MANAGEMENT—Public Relations

Northwest Utilities Conduct Summer

Companies comprising Pacific Northwest Power Co show proposed power sites

Two-day trips are creating clearer understanding of Northwest power picture

Four Northwest utilities this summer are introducing large numbers of press representatives to what will probably be the site of the next great hydro power project in the region.

The companies are Pacific Power & Light Co, Portland General Electric Co, Washington Water Power Co, and Montana Power Co. Together they comprise the Pacific Northwest Power Co, formed to build the proposed Mountain Sheep and Pleasant Valley projects on the Snake River.

As the site of the million-kilowatt hydro development, it has kindled the imagination of residents of the power-conscious Northwest. The series of press tours into the picturesque region is giving news, radio and TV men from much of Oregon, Washington, Idaho, and Montana an opportunity to see for themselves the sites of these projects.

It's a two-day trip. In groups of about 30, the press tours leave Lewiston, Idaho, at 6 A.M. aboard the sturdy river boat Wenaha. A dozen hours later they arrive at Pleasant Valley, upper of the two sites.

Next morning a snorting power wagon carries the party by groups over an impossible trail gouged out of the mountainous cliff to a vantage point 450 ft above the river. Here an engineer points out the crest line of the proposed 500-ft concrete arch dam and its 1,200-ft span to the opposite shore. The project calls for an initial installation of 725,000 kw, with ultimate capacity of 870,000 kw. The 145,000-kw generators proposed would be the largest hydro units in the world.

Departure about 9 A. M. sees the Wenaha achieve more than twice its upstream speed. Twenty miles downstream the tour halts at China Gulch to look over Mountain Sheep site, second half of the proposed $200,000,000 project. Installed capacity here initially is planned at 275,000 kw, with an ultimate of 367,000 kw.

The tours are made at two to three week intervals. Five large tours are scheduled although some of the late ones may be broadened to include business and civic leaders.

PARTIES ARE TAKEN UP SNAKE RIVER ON RIVERBOAT WENAHA, WHOSE PILOT KNOWS ALL RIVER'S TREACHEROUS SPOTS

Press Tours on Rugged Snake River

MOUNTAIN SHEEP dam will be located above junction here of Salmon and Snake Rivers; won't block fish migrations

TV CAMERAMAN makes pictures of project sites to show home audiences

PRESIDENT ELECT M. D. HOOVEN (CENTER) IS CONGRATULATED BY PRES MONTEITH (LEFT) AND SECRETARY HIBSHMAN

At Summer General Meeting . . .

AIEE Dwells on System Development

Preparation for future needs in power systems and equipment marked many sessions of the AIEE summer general meeting at Swampscott, June 27-July 1.

System planning and systems engineering applied to both utility communication and industrial installations received a significant share of attention at a program that touched on many of the specialties of the profession.

For utility engineers, particularly, there was timely disclosure of developments closely keyed to growth problems of expanding power systems.

These things were significant:

- Utility management is more than ever looking to system planners for logical, economic development of systems.
- But there are hurdles; among them is need for coordination particularly between planners and relay men.
- Load forecasting, key to planning, varies in technique and needs discussion to develop fuller understanding.
- A high level of interest continues in automatic load frequency control and economic dispatch computers.
- Transmission design turns to low-alloy steel for tower economy; studies parameters of untransposed lines.
- Tests extend knowledge of freezing technique to hold oil in pipe cable. Freeze length and time fixed by size.
- Polyethylene holds promise for higher voltage cable; improvement in temperature characteristics predicted.
- Network voltages of 460-v prove economical for heavy densities; spot installations with radial mains increase savings for concentrated loads of 3,000 kva or more.
- Symposium on networks sets cable temperature limits and clears way to coordinated limiter-fuse applications.
- Voltage correction by series capacitors in distribution transformer primaries is accepted but disagreement attends performance under fault conditions.
- Field tests find surge attenuation less on 40-69 kv cables than for the lower (15-kv) voltages.
- At 24 kv connected lines cannot reduce surge voltage enough to protect substation equipment without arresters.
- Faults on lines being sleet melted may threaten equipment already operating near its thermal limits. Relay scheme to guard against unsymmetrical faults told.
- Pole life data show that full creosote treatment gives average exceeding 35 years, but continued study is urged to prepare for ultimate large scale replacement.

The details of these and other developments of electrical industry interest at AIEE are summarized on the following pages.

Need for Power System Planning Grows

- **Survey of planning practice finds managements interested**
- **Growing awareness of need for coordination found**
- **Load forecasting a primary responsibility; methods discussed**
- **Forecasters warn against predicting major depressions**
- **Statistical correlations fail in forecasting farm use**

Utility managements today are increasingly aware of the need for system planning. They look upon it as a form of insurance that system development will be carried out in an economical and a logical manner. This was apparent in replies of the majority of utilities answering a questionnaire of the System Planning Subcommittee. They recognized that planning requires a high degree of coordination and is best handled by a department organized for the purpose and responsible to a high-level executive. In more than half the cases, the executive was responsible for engineering.

The survey report, compiled by D. C. Vaughan, Potomac Electric Power Co. and J. H. Rixie, Jr., of REA, indicated that responsibilities of system planning departments include system resources—generation, transmission and interconnection capacity —and the integration of these resources into an economical whole. Assignments vary considerably, but it was reported that 68% of the departments were involved to some extent in planning both generating stations and transmission and distribution systems. Responsibility for setting standards of system reliability, reserves, and equipment ratings were found to be shared with other departments in most cases.

Forecasting Methods Vary . . . Load forecasting, a primary province of system planners and the jump-off point for system engineering and development, was the exclusive topic of one of the three system engineering sessions at the summer meeting. It brought together on a single panel of authors, some of the utility industry's leading authorities on techniques of forecasting demand for electricity.

The forecasting procedure used by Public Service Electric & Gas was summarized by R. G. Hooke. It consists of forecasting sales by classes of service for a time interval of either a year or a month, ten years in the future. A secular trend is drawn from present date to the forecast condition ten years hence. Next an estimate is made of expected deviations from trend, in near term years. By summing the estimates of sales and adding losses and other adjustments, a forecast of total output is made. Expected peak demands are obtained by correlating peaks with consumption and system output.

Out of experience, Hooke said the most important forecasts are those from one to four years hence, since they warn of needed additions to plant. He warned specifically against attempting to forecast depressions and of the impracticality of forecasting military actions, which may occur at any time. Hooke makes no attempt to forecast major deviations from trend, but prefers to come up with figures "as likely to be exceeded as not."

The economic-correlation method of load forecasting used by Cleveland Electric Illuminating Co. was described by W. W. Godard. By this method, class loads are estimated separately and combined on a coincident basis. The plan calls for correlation of estimates with the economic pattern to compensate for curtailments, displacements, and new loads not specifically known at time of estimate. The Federal Reserve Board Index of Industrial Production and the Bureau of Labor Statistics average weekly hours per employee for the U. S. are most important factors in this method. For the CEI area Godard found that a marked similarity exists between net increase in residential customers and the mathematical product of National Housing Starts and the FRB Index.

Farm Forecasts Difficult . . . In forecasting farm electric power requirements, statistical correlations have failed to produce formulas which can be used to predict usage, E. R. Brown and R. D. Partridge of the Rural Electrification Administration have found. They attributed difficulties with statistical correlation to lack of precise measurement data for some of the independent variables. Thus they resorted to the market research type of appliance survey to estimate the appliance and equipment saturation three years in the future. From these data they were able to derive usage estimates which can be projected safely beyond the three-year period when appropriate adjustments are made.

Business Machines Helpful . . . Bonneville Power Administration has for several years successfully used business machines to estimate power needs for both operational and planning purposes, James G. Gruetter, BPA load forecasting officer told the planners.

Punched card accounting equipment has been adapted to the needs of BPA, making it possible to conduct investigation that otherwise wouldn't be considered with a limited staff.

The card system reveals accurate information on the power needs of 87 different distribution systems, 12 federal agencies, and 17 industries served at 322 points of delivery. The system is also used for compiling information on coordinating and operation of storage reservoirs, long-term planning of transmission, generation, customer service facilities and rates.

LAMME MEDALIST A. M. deBellis, Consolidated Edison (right) gets warm congratulations from AIEE Pres A. C. Monteith at Swampscott meeting

AIEE MEETING REPORT

Plan System and Relaying Together

- **Widening use of three-terminal lines poses relaying problems**
- **But system planners urge use to effect economies**
- **Need for relay engineers on planning groups suggested**
- **Relay protection scheme for sleet melting operations proposed**

A close working relationship between system planners and relay engineers is vital if designers of today's expanding power systems are to achieve a proper balance of economy, reliability and simplicity.

This was the theme of three out of four papers at the joint system engineering and relaying session. There was more than a hint by some authors that absence of coordination between planners and relay men today contributes to the cost and complexity of power systems.

E. L. Michelson, Commonwealth Edison, warned that if a planner designs a new system without thought to the relaying problem, difficulties may be encountered in later stages of the project. Relaying, he said, is an integral part of system planning. System design factors must be correlated with relaying limitations if the most economical and reliable system is to result.

Michelson cited use of the three-terminal or tapped line as one of the most controversial questions in the field of power system design and relay protection. The system designer, he said, desires to use such lines to effect economies in lines and station equipment. But the relay engineer finds them difficult to protect and their use hazardous to system reliability.

Solution to the problem, Michelson said, is inclusion of engineers familiar with relaying problems in system planning organizations to review proposed plans and point out relaying problems to be encountered.

In apparent agreement, John R. Linders, Cleveland Electric Illuminating said, "The protective relay engineer can be of great value to the system planner when he is consulted before a system investment is initiated. The man-hours spent by the relay engineer will be more than recouped subsequently when specific relay calculations and details must be worked out."

Linders described how a 11.5-kv switch house was damaged by a feeder reactor failure during a cable fault, and a $5-million investment deferred through application of protective relays in a novel manner. Use of sequential tripping under controlled conditions can result in benefits similar to those derived from cascade tripping of low-voltage switchgear, he said.

Propose Planning Nucleus . . . J. E. Barkle and J. L. Blackburn, Westinghouse, felt that the protective engineer and the system designer should form the nucleus of the system planning organization, so that both will be associated with planning from the very beginning.

The relay man can run away with what the planner saves unless you lay down some standards on what is acceptable as a calculated risk in system planning, H. K. Sels, Public Service Electric & Gas, warned. He urged individual companies to go further and establish a set of planning standards. L. F. Kennedy, General Electric, saw the relay engineer as inherently a planner whose aim is to increase system reliability and so to conserve manpower. A. H. Burkhalder, Ebasco, expressed hope that relay engineers would soon realize their long-held hope for a reliable line differential relay. Microwave offers the best promise, he felt, but has not been feasible because of high costs.

Relays and Sleet Melting . . . For relay men a protective scheme was proposed to meet the threat of undetected faults that may occur on lines being sleet melted by the short circuit method. J. C. Hogan of the University of Missouri, and C. G. Pelber, Commonwealth Associates, showed that small unbalances or overcurrents that go undetected by source-end relays may damage lines and equipment already operating near their thermal limits. They proposed using phase balance current relays at the short circuited end of the line in addition to source-end relays to detect unsymmetrical faults.

COMMITTEES MEET in open air. Here is working group on sound measurement

New Control Schemes Guide Power Generation

A high level of interest continued among utility system engineers in the subject of automatic load frequency control systems and the application of the electronic computer to economic scheduling and control.

Operation of an automatic load frequency control system that was tested for a year at Dennison Dam, Texas, in a power system serving the entire state, was described by Gustave Ehrenberg, Minneapolis-Honeywell Regulator Co. By regulating output of only two 37.5-kva generators, the load dispatcher was able to hold frequency of the 1,000-Mw power system within ±0.03 cycles, using this system. In the control scheme, the reset and proportional control modes are transmitted as a combined signal directly to the stations of the system over a single telemetering channel.

An economic dispatch computer, employing circuits and techniques used in electronic differential analyzers to obtain computing accuracy that is limited only by accuracy of the data, was detailed by C. D. Morrill and J. A. Blake, Goodyear Aircraft Corp. The console is arranged to plot dispatch curves and incremental heat rate curves for each generating unit at each station of the system. Under manual control, it can produce complete generation schedules at a rate of about two or three stations per min. But when it is used for automatic control, speed is purposely reduced.

M. H. Walsh, Duquesne Light Co, described a low-cost automatic computer for economic load dispatching, in use at Pittsburgh since 1952, that incorporates a penalty factor adjustment of the coal cost dial. It can be used wherever incremental fuel cost is in terms of steam valve position.

Design Cuts Transmission Cost

- **Low-alloy steel contributes to economy in tower design**
- **Unbalance ups losses, limits length of untransposed lines**
- **New method speeds stability studies with adding machine**

High-strength, low-alloy steel has essentially replaced structural steel for transmission towers where strength requirements are severe, said H. M. Walton, U. S. Steel. Its slightly higher yield point is attractive to designers and its ease of fabrication aids the manufacturer. Best prospects for economy are found in specifying high-strength steel for members subject to reversals of stress. Leg sections, for example, can generally be reduced by ☆ in. Optimum economy, said Walton, depends upon ingenious use of materials and patterns.

Electromagnetic unbalance on untransposed lines of the single-circuit overhead type with two ground wires and varying protective angles was investigated by E. T. B. Gross and S. W. Nelson, Illinois Institute of Technology. Zero-sequence unbalance is affected much more by changes in ground wire spacing than is the negative-sequence unbalance. Per contra, negative-sequence unbalance is effected more appreciably by phase conductor changes in configuration. In the discussion, 100 miles was suggested as the maximum run desirable for non-transposed construction. Magnetic unbalance increases losses and reduces line working capacity.

Analytical Methods Extend Knowledge . . . Combination of tensor analysis and a high-speed electronic digital computer provides an exact and practical method for solving difficult power circuit problems, reported R. B. Shipley, M. Hochdorf, and M. Watson, all of TVA. Six parallel 161-kv transmission lines, each about ten miles long on a common right of way, were investigated as a major objective. The authors stressed the value of this technique in studying such problems as the effect on power current unbalance of electrical and physical dissymmetry in lines of non-identical lengths due to line terminations and variations in number of circuits and ground wires.

Influence of unbalance on total current carrying capacity, possibilities of correction by changing the phases on individual circuits, and the practicability of establishing a zero-sequence equivalent circuit to permit accurate application, settings and analysis of ground relays all fall within the scope of the method utilized by the authors.

Transient Stability Studies . . . E. A. Norinder, Swedish State Power Board, described a fast and reliable method for step-by-step calculations of power system transient stabiltiy of power systems. The calculations are matched to ordinary office calculators. The differential equation for an average load angle of a group of mutually synchronous power systems (or of a single synchronous machine) is deduced as a function of the electric power delivered. The mechanical torques from the prime movers are assumed to be constant. With one man making measurements and multiplications and another operating the adding machine, complete stability runs on a 16-generator system have been made in less than three hours.

The use of calculating boards and differential analyzers is expanding rapidly. C. Concordia, General Electric, showed that angular swings produced in a synchronous condenser by sudden applications of an arc furnace load do not in general increase the magnitude of the accompanying voltage dip. Tests by analyzer showed that a criterion for stable operation, so far as related to disturbances arising at the arc furnace is concerned, is that the buffer and system reactance be kept smaller than the effective reactance of the arc furnace transformer and secondary leads.

T. H. HAINES and R. W. ATKINSON, both retired, chat during meeting break

Tests Guide Freezing of Pipe Cable

Complex semi-stop joints in pipe-type cable runs may prove unnecessary, suggested E. J. Merrell, Phelps Dodge. Tests of freezing to stop off an oil-filled section, while an adjoining section is drained show that:

1. Freezing repeatedly with dry ice does not damage pipe cable components, even at 300 psi hydrostatic head.

2. Thawing does not damage cable dielectric or polyethylene jacket.

3. A hard freeze holds pipe oil on one side while 25 cu ft per hour of dry gas is fed into the drained section 1 foot from the freeze.

4. Freeze length is primarily governed by pipe size, but may have to be extended if applied shortly after cable is removed from service.

5. Freezing time is a function of pipe size and trough length. Dry ice can be used alone, but freezing is speeded by addition of acetone or methylene chloride.

Discussion revealed agreement that dry ice is a satisfactory freezing medium. Use of colder agents, like liquid air, was discouraged.

Voltage Grows for Polyethylene . . . Polyethylene insulation of 219 mils thickness has been used rather widely for 15-kv cables in grounded-neutral service, reported S. J. Rosch, Anaconda. Irradiation and/or improved polymerization may ultimately raise its softening point to 125C, a 100% gain. Cracking is becoming less troublesome, and black pigmented jackets have proved highly resistant to outdoor exposures. Discussion disclosed possibilities of using polyethylene for much higher voltages. R. W. Atkinson, General Cable, cited its low power factor as a qualification, and E. J. Merrell, Phelps Dodge, suggested interleaved layers of polyvinyl chloride to suppress corona. At 400 kv, said Merrell, some increase in losses may be essential to insulation stability.

Distribution Accents Voltage, Poles

- **Higher network voltage proves economic for heavy-density**
- **Capacitors in series with distribution transformer primaries provide voltage improvement but require precautions**
- **Fully-creosoted poles show long service life but require continued study to guide ultimate replacement policies**

Evaluation of higher secondary voltage for commercial areas, said R. F. Lawrence and D. N. Reps, Westinghouse, shows:

1. Network load and density have important bearing on design and cost.

2. Primary supply to networks of either 208 or 460 v is economical at 13 kv, but higher supply voltage gains favor as load and distance increase.

3. Spot loads of 3,000 kva or more are economically served at 460 v.

4. Maximum distance between interconnected spot networks for economical transfer of power is 360 to 640 ft at 460 v, compared with 180 to 320 ft at 208 v.

5. Load densities over 50,000 kva/sq mile are more economically served by spot networks with radial branches than by general networks.

Evaluate Capacitors in Series with Transformers . . . Installation of low-voltage capacitors in series with the primary of distribution transformers shows desirable voltage improvement, reported G. G. Auer, R. J. Hopkins, R. G. Livingston, and N. M. Neagle, General Electric. Where reactive var load is constant, voltage rise is also fairly constant, and voltage flicker caused by varying reactive loads may be reduced. Disadvantages cited for the series capacitor application were greater fault currents, secondary overvoltages during certain secondary faults and from ferro-resonance, and need for equipment to protect conventional capacitors or special self-protecting capacitors.

A companion paper by R. F. Lawrence and L. W. Manning, Westinghouse, cited the gain in ability to use distribution transformer overload capability when series capacitors correct for voltage drop. They recommended applying capacitors selected to give about 4% impedance and rated at 250% the continuous current ratings of associated transformers. Inexpensive protective devices are available for the capacitors, they said, but omission involves negligible risk.

Discussion emphasized that series capacitors do not lighten transformer loading. Where the voltage condition reflects overloading, particularly under heat storm conditions, W. A. McMorris, General Electric, urged adding transformer capacity instead.

Seek Longer Pole Life . . . Useful life of creosote-treated poles now is known to exceed an average of 35 years. But scarcity of new poles and the high cost of replacement justify extending life by

1. Careful initial selection and treatment.

2. Periodic inspection and testing while in service.

3. Re-treating in place, or full-length treating any that have been removed from service.

Continuing their analysis of poles, J. A. Rawls, Virginia E&P, and M. S. Hudson, consulting chemist, warned that the large number of 30-year-old poles in service must eventually be replaced. They urged collection of data to forecast expenditures.

Data collected by C. A. Booker, New England Power, on 426,000 creosoted pine poles purchased since 1928 indicate that only 2-3% are condemned within 25 years, reported Frank Buxton. The annual rate after that period approximates 0.3%.

Symposium Clarifies Network Protection

Characteristics and application of non-leaded cable in low voltage secondary networks were thoroughly documented in a nine-paper symposium by authors from nearly as many companies. Their well-integrated cooperative approach to network cable problems directly reflects the standardization of practices which has evolved since the first ac networks were started in the late '20s.

Present practice of most network-using utilities is rubber-insulated Neoprene-jacketed cable for street mains, with 500 MCM preferred, reported Andrew Bodicky, Union Electric. Joints and connection generally are of compression type, usually insulated with rubber tape reinforced by an outer layer of plastic, neoprene, or friction tape.

The trend to nonmetallic-sheath cable started about 1930, added S. J. Rosch, Anaconda, with emphasis on resistance to moisture and ability to withstand short-time overloads. Subsequent developments have applied Neoprene for sheaths and buna, oil-based, and butyl rubbers for insulation. The need today, Rosch implied, is industry standards for network cables to exploit the characteristics of each type of insulation to fullest advantage. Discussion revealed differences of opinion among cable manufacturers as to the insulation stability and explosibility of butyl insulation.

Tests Set Cable Damage Limits . . . Tests by six manufacturers set the threshold of visible damage for RH-RW insulation with Neoprene sheath at 260-290C, reported R. C. Graham, Rome Cable. Similar tests on oil-based buna compounds and on butyl insulation, both with Neoprene sheaths, ranged from 220 to 260C. Inconclusive data indicate that lead sheaths cut allowable temperature 20C and polyvinyl chloride deforms at 105C. Graham proposed that insulation be tested by passing current through 20-ft of 4/0 cable in air; 240C corresponds to about 800 amp.

Oven testing classifies the ability of rubber and rubber-like insulation to withstand high short-time temperatures, suggested W. H. Couch and G. J. Crowdes, both Simplex Wire & Cable. Oil-based rubbers, both natural and buna, showed damage in 15 min at 200C, but low-water absorptive compounds withstood 240C and RH-RW took 30 min at 260C.

Similar cable in ducts has much lower current limits. Six 4/0 RH-RW cables, two per phase, reach 240C in 220 min at 500 amp, according to data presented by L. F. Porter, Con-

(*For more AIEE report see p.* 194)

MASTER PLAN GAVE G STREET, ALACATA, 6,000-LUMEN, PENDANT UNITS GIVING 0.6 to 0.8 FT-C INTENSITY

SALES—Commercial

Master Plan Gives Modernized Street Lighting to 51 Communities

G. A. TROSPER, Street Lighting Engineer, Pacific Gas & Electric Co, San Francisco, Calif.

A long-range program of modernization of street lighting is paying real dividends for Pacific Gas & Electric Co and the cities and towns it serves. The Master Plan for Street Lighting, as it is called, is designed to replace a city's entire street lighting system gradually and without placing an overwhelming financial burden on the city or company. For PG&E, the master plan has resulted to date in a net increase of over 1,100 kw of new street lighting during an eight-year period. The estimated increased revenue is $221,000. These figures represent 51 cities and towns that have taken advantage of the plan. More than 20 other communities have requested them.

Master Plan Meets the Demand . . . This overall program for street lighting was prompted by the mushrooming of many cities in the PG&E service area after the war. It afforded the best and most practical solution to problems created by the inadequacy of old lighting systems and the tremendous demand for new lighting systems. Recognizing that every city in northern California needed and would be wanting modern street lighting, PG&E offered to help city officials plan new lighting systems. No charge is made for engineering. Only the regular charge for street lighting service is made as new lights are installed. City-

CITY COUNCILMEN CONSULT WITH AUTHOR (SECOND FROM RIGHT) ON PLAN

owned portions of the street-lighting system are included.

In laying out a plan, consideration is first given to the general nature of the city for which the plan is intended. Generally speaking, American cities follow definite area patterns. There are one or more business areas with primary streets leading in and out. Most cities have an industrial area and one or more types of residential areas. Cross-town laterals tie these areas together. Lighting for each area is treated separately.

Consider Effect of New Lighting . . . Areas are located and defined. Traffic flows and citizens' habits are studied. With existing conditions as a base, estimates are made of future traffic flows and changes in use of the streets as a result of better lighting. A street with good lighting draws more pedestrians and a well-lighted shopping center attracts more traffic.

Other important factors are seasonal conditions, shade trees, traffic volumes at vital points, and the direction of city growth. Special night problems in the city are explored. Problems of the police and fire departments are investigated.

With this information listed and studied, the laycut is planned. Each proposed street-light location is checked for unusual conditions, such as overhanging branches, garage entrances, etc. Relocation of existing lights to get the best lighting results may be necessary. For example, length of a mast arm or bracket is noted on field maps.

Special Symbols Are Used . . . The master plan map is prepared from these maps generally to a scale of 200 ft to 1 in. To represent various types of street lights on the master map, rubber-stamp symbols were designed, as illustrated. Symbols are sized to show a fairly accurate light pattern on maps with a scale of 200 to 300 ft per 1 in.

To show the ratings of incandescent lamps, a color code was devised. Symbols representing mercury-vapor lamps are bright green, with the rating in lumens alongside them. In addition, a color code is used to classify and identify different areas of the city. Danger spots are indicated by bright red circles on the map.

With these symbols and the use of colors, a complete lighting pattern can be made for any city. Several map sections may be required to cover larger cities.

Presenting Master Plan . . . As a rule, city councilmen are interested in street lights. They and the city manager or city electrician should be consulted on initial planning. It has been found advantageous to present a semi-final drawing to a full meeting of the council, where the plan may be explained in detail. As planning progresses, the councilmen often take over the master plan, either wholly or in large part; as their final proposal.

Master plans usually cover about ten years. Of the more than 70 communities that have requested master plans, two decided to complete their plans immediately. Chico, with a population of 14,000, asked that its street-lighting plan be completed in two years.

Standardization Is Key Factor . . . An important contributing factor to the success of the idea is the street-light standardization program of PG&E. This program covers every phase of street lighting equipment and materials, their transportation, warehousing and installation.

During the second world war, the company decided it would make a fresh start at the war's end with the most efficient type of street lighting equipment available. This decision was made even though a study of existing company-owned equipment revealed only a few standard sizes of parts and fittings.

Company standards for equipment and quality street-lighting service included the IES standard lighting patterns adopted by ASA as the American Standard Practice of Street and Highway Lighting. Interchangeability of parts among different makes of luminaires, as specified by EEI, is a company requirement.

This part of the standard has simplified warehousing and maintenance and reduced the amount of excessive inventory.

To provide a good-quality lighting system under a variety of conditions, the company standardized on five types of light patterns. IES types I, II and III are lens glass units as specified by ASA. Type IV has a deflector in plain glass; type V is plain glass without deflector.

Symbol	IES Type	Description	Typical Horizontal, Candle Power Distribution Curve	Application
	I	2-Way Distribution	15° 180° 15° 90° 90° 15° 0° 15°	For mounting approx over center of narrow streets or alleys
	II	Narrow Asymmetric Distribution	90° 180° 90° 25° 0° 25°	For side mounting on streets not over 40 ft curb to curb
	III	Medium Asymmetric Distribution	90° 180° 90° 40° 0° 40°	For side mounting on streets 35 ft to 60 ft curb to curb
	IV	Wide Asymmetric Distribution	180 90° 90° 60° 0° 60°	For side mounting on streets not less than 50 ft curb to curb
	V	Symmetric Distribution	180° 90° 90° 0°	For mounting in center parkways, intersections, etc.
M.M	VI	Radial Wave Reflector - up to 1,000 lumens only		

RUBBER STAMP SYMBOLS were designed to represent types of street lights on master plan and are sized to show light pattern scaled 200 to 300 ft per 1 in.

Tell Employees of New Standards . . . After the new standards had been worked out in sufficient detail, the company undertook a program of educating all employees engaged in street lighting. Standard drawings were given to every electric operating and installing crew. These covered all street lighting material, its transportation, warehousing and installation. Ordering instructions were provided for construction crews.

Then personal contacts were made in all divisions by the author and Kermit Sather, from PG&E's engineering department, to instruct installation crews and warehouse personnel about the new equipment. Meetings were held in all 13 company divisions with more than 1,000 foremen, estimators and warehousemen participating.

Lighting Hits Its Stride

- **There's a strong revival of interest in the industry's "Old Reliable"**
- **Utilities are looking to it for balanced loads and new growth opportunities**

Lighting is looking up. The old standby of the industry is capturing a new place for itself in utility sales planning —a place unequaled since the days when it was all the industry had to sell.

In the past year at least four new industry lighting programs have been set up. At the same time, manufacturers report new interest in the lighting forums and clinics they sponsor for utilities.

As one industry figure put it: "We're giving the old gal the glad-eye again after years of playing the field."

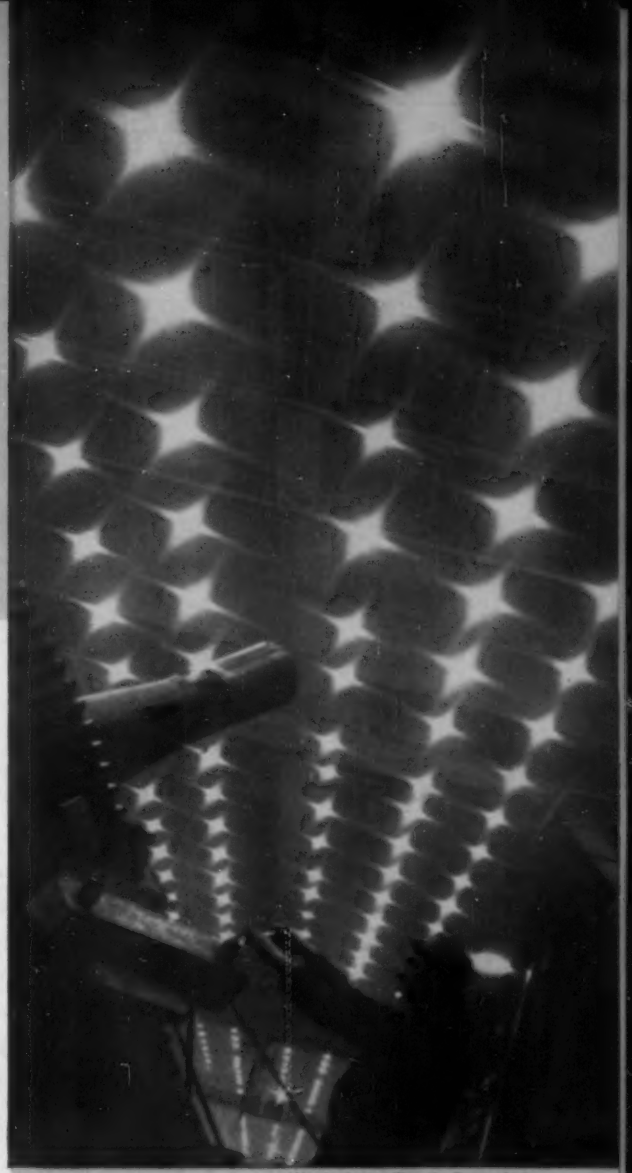
What are the "old gal's" sudden new charms? Number one, it looks like a good bet for soothing ruffled load curves. As Union Electric Co's Merrill Skinner points out (page 93), few individual appliances have annual load factors as high as lighting. Along with this, its responsibility for load peaks is dropping, and, to many utilities, it looks like a promising offset to summer peak problems.

Besides being a salve for operating sore spots, utility men see another charm in lighting. It is a good money-maker. In a survey made for Westinghouse Electric Corp last year by Ebasco Services, Inc, executive after executive expressed high optimism in lighting's growth potential, and its ability to build badly needed net revenues.

But just how well the market will respond depends. The Westinghouse survey reports: "It can be assumed that both lamp and equipment developments will keep abreast of the needs. The question may very well be whether the educational and promotional efforts of the industry can be brought to bear strongly enough to persuade the consumer to go forward fast enough."

The responsibility appears to rest largely with the utility.

A look at the way this responsibility is being met, plus a description of the market itself, follows on the next 11 pages. Thanks are in order to Edison Electric Institute, National Electrical Manufacturers Association, Sylvania Electric Products, Inc, and the Lamp Divisions of General Electric Co and Westinghouse for their help in developing this material. Equal appreciation goes to the utilities quoted or mentioned in the pages of this story.



Westinghouse Electric Corp. photo

The Big Market . . . . . **page 92**
Why Sell It? . . . . . **page 93**
Where Sales Come From . . . . . **pages 94-101**
How Much To Spend . . . . . **page 100**
Mass-Selling Through Education . . **page 102**

How Lighting Is Growing . . .

	Year	Industry Sales . . . Lighting Kwhr Consumed (Billions)	Large Lamps Sold (Millions)	Lumen-Hr Produced (Trillions)	Per Capita Use . . . Lighting Kwhr Consumed	Large Lamps Sold	Lumen-Hr Produced (Millions)
The Past	1920	8	192	70	75	1.8	0.7
	1925	12	278	133	104	2.4	1.1
	1930	18	383	244	146	3.1	2.0
	1935	27	508	428	212	4.0	3.4
	1940	40	648	726	303	4.9	5.5
	1945	59	802	1,189	422	5.7	8.5
	1950	84	965	1,886	554	6.4	12.4
Now	1955	118	1,133	2903	716	17.6	6.9
Next Ten Years	1960	164	1,304	4346	924	24.5	7.4
	1965	224	1,474	6336	1,180	33.4	7.8

(Figures developed for Electrical World by General Electric Co Lamp Division)

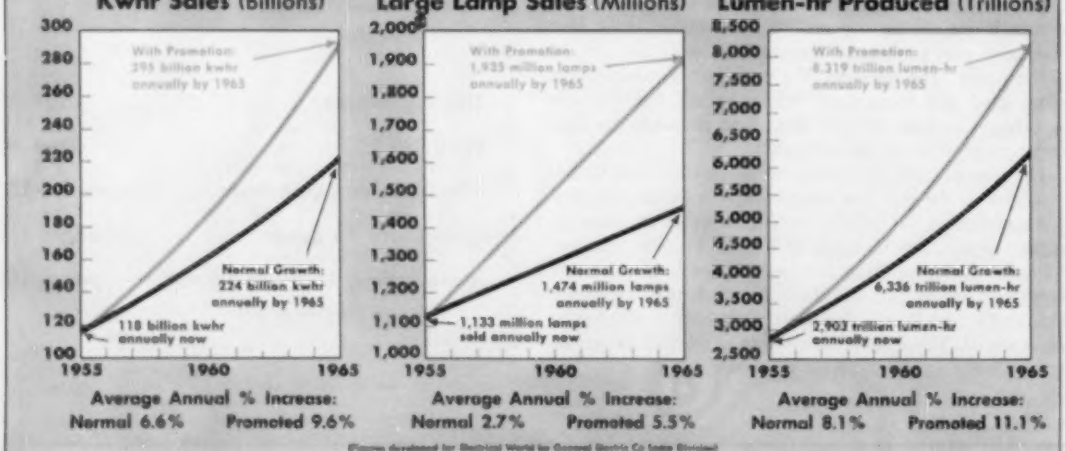
The Lighting Market Is Big . . . And with Promotion Can Be Made Even Bigger

- Its share of total energy sales has been steadily declining . . . this trend is expected to continue
- At the same time, total kwhr sold for lighting has had a phenomenal rise . . . It is double what it was in 1945, and will nearly double again in next ten years
- But this is natural growth . . . with promotion, the kwhr sold in 1965 could be 32% more than what is expected

Electric energy consumed for lighting is double today what it was ten years ago. And in the next ten years it will nearly double again. At present it accounts for about one-fourth of all utility electric sales.

Look at the table above. Using 1940 as a base, kwhr sales this year will be 292% more than what they were then, and by 1965 will be up 557%. Large

Here's What Some Selling Could Do . . .


Kwhr Sales (Billions)
With Promotion: 295 billion kwhr annually by 1965
Normal Growth: 224 billion kwhr annually by 1965
118 billion kwhr annually now
Average Annual % Increase:
Normal 6.6% Promoted 9.6%
Large Lamp Sales (Millions)
With Promotion: 1,925 million lamps annually by 1965
Normal Growth: 1,474 million lamps annually by 1965
1,133 million lamps sold annually now
Average Annual % Increase:
Normal 2.7% Promoted 5.5%
Lumen-hr Produced (Trillions)
With Promotion: 8,319 billion lumen-hr annually by 1965
Normal Growth: 6,336 trillion lumen-hr annually by 1965
2,903 trillion lumen-hr annually now
Average Annual % Increase:
Normal 8.1% Promoted 11.1%
1955
1960
1965

(Figures developed for Electrical World by General Electric Co Lamp Division)

lamps sold are 175% ahead of 1940, and ten years from now will be up 227%. Consumers will use 400% more light this year than they did in '40 and lumen-hr produced in '65 will be up 873%.

"But," says James C. Forbes, market development manager for GE's Large Lamp Department, "this is the result of natural growth only. If we sell lighting vigorously . . . these lines will go right off the chart." Those at the bottom of the preceeding page show what he means.

What are the factors that underlie this promised growth? First there are continuing new developments to spur use of lighting. Although nothing may turn the market upside down as the fluorescent tube did in 1938, manufacturers point to such things as new alloys which could up operating temperatures of filaments, simpler fluorescents, further development of high frequency lighting, and perhaps even electro-luminescent panels. A second factor is the rapid population rise. Third, is a new consumer demand for more and better light. With more money in their pockets, people are expected to engage in more "emotional" buying. This makes them a lush source of sales for dramatic, mood, and decorative lighting. Many marketing men strongly feel that sales of lamps and lighting in the future should be built on emotional appeals.

Industry experts also have some other facts and figures which should make lighting all the more appealing to the electric utility:

- Home lighting is now only about 20% saturated;
- Total lighting wattage in the home is one-fifth what it should be;
- Nine out of ten commercial and industrial customers need relighting.

What then could hold back its growth? Chief deterrents, said utilities in the Westinghouse survey, could be: (1) lack of trained personnel; (2) inertia of contractors, dealers, and utilities; (3) absence of market analysis on potential cost and value of lighting.

The third of these is particularly disturbing. Although it is their oldest load, utilities seem to know comparatively little about lighting in terms of cost to serve, net return, and the amount they can spend to get new business (page 100). Utility executives are quick to admit that they must accumulate more of this kind of information, and learn to use it if they are to effectively develop the market.

Why Should Utilities Go After The Lighting Business?

A power company executive gives his eight reasons

MERRILL E. SKINNER, Vice President, Union Electric Co of Missouri, St. Louis

1 —Ceiling Unlimited—We have a long way to go to match sunlight. Every target for lighting levels is one that we get. Our customers will accept higher and higher levels of lighting, so long as we engineer the installation for comfort, as fast as we have the courage to sell them. In the case of some other loads when everybody's got one, we're through. With lighting, we're never through.

2 —Common Denominator of Our Business—It penetrates and serves every market. It is important to every company—large or small—straight electric or combination—urban or rural, loaded with industry or looking for it.

3 —Our Largest Single Source of Revenue—We have a gorgeous new supermarket in St. Louis. It has everything—an electric eye opens the door for you. It is air conditioned. It provides music while you shop and has an all-electric fountain and lunch bar. Yet, lighting accounts for 50% of the use. When you increase your lighting load, you are working on the largest single element of your load. A small percentage increase represents a lot of kw.

4 —No Competition—Gas can't touch this part of your business. And there is no competitor in sight. Technical improvements in the lighting field go forward, and improved efficiency instead of hurting our business opens new vistas.

5 —Desirable Load Characteristics—Lighting is a very desirable load from the point of view of power factor. By the end of 1955 the Union Electric system will have an investment of approximately $4 million in capacitors to handle low power factor loads. But for the large block of lighting load with its near unity power factor, this investment would be even greater.

Lighting adds stability to the system load curve. In stores, offices and factories lights go on at the beginning of the day and stay on all day, or, all night. This is a steady non-fluctuating load, the kind we relish. Best estimates place **annual** load factor of various classes of lighting service at from 15 to 20% for residential, from 30 to 40% for commercial and industrial, and about 45% for street lighting. Another important fact is that lighting is essentially the only load we have to fill the night-time valley on our system load curves when our most efficient generation is on the line.

6 —Its Peak Responsibility is Dropping—In the early days, lighting had to carry full responsibility for the system peak load because there was no other load. Today things are quite different. Percentage of lighting load which is coincident with the system peak depends on the nature of the individual utility's load curve, which, in turn, depends on such factors as the utility's geographic location and the nature of the dominant load served.

Even before air conditioning catches up with you, you may find lighting is off-peak on your system due to temperature limitations on system capacity. As ambient temperatures rise, safe loading on transformers and other transmission facilities must be limited. As condensing water temperatures rise, generating stations lose capacity. So, if your summer peak is within 20 or 25% of the next winter's peak, you may find that it is summer load which is establishing need for capacity.

7 —Your Refuge from Air Conditioning Problems—Companies in our St. Louis latitude and to the south of us already have summer peaks, and don't get smug about it if you are further north. In my opinion nothing can stop Mr. and Mrs. America from enjoying summer comfort. To complement air conditioning about all you have to work with are lighting and heating. Heating with electricity runs into some pretty rugged competition, and I'm not so sure but that a dollar spent on lighting promotion won't do more good in many such situations than one spent on heating. We spend them both.

8 —Generates Good Public Relations—Good lighting contributes significantly to your public relations. The home owner whose home is beautifully and adequately lighted, the retailer who is aware of the benfits he has derived in terms of increased sales due to good lighting, and the industrialist who knows of the added profits he has earned through increased efficiency due to well-engineered lighting in his factory and office, are all willing subjects for being sold more electrical living.

Mr. Skinner delivered this paper at Edison Electric Institute's 21st annual sales conference March 31, 1955

MOST INDUSTRIES MUST PROVIDE ADEQUATE ARTIFICIAL LIGHT, ESPECIALLY IN WINTER WHEN TWILIGHT FALLS EARLY

INDUSTRIAL: Light Heads the List of Important Controllable Factory Conditions

Although industry set the pace during the war years by harnessing new fluorescent lights to raise output figures, the industrial market is still lush. A spot check showed that 85% of the industries in Indianapolis had sub-standard light. Subsequent surveys elsewhere verify the figure. Utilities are closing in on this desirable load, and EEI and NEMA are helping out by providing strong work tools for a tough sales job . . .

Mismatched fur pelts can sink the retail value of the garment $1,000. That's why quality furriers insist that pelts be matched in a special blend of carefully controlled light.

The need for good light permeates all industry. A survey by McGraw-Hill's Factory Management and Maintenance magazine reveals that plant managers place a great value upon

PROPER ASSEMBLY OF MINIATURE ELECTRON TUBES REQUIRES KEEN EYES, DEFT HANDS, AND PLENTY OF GOOD LIGHT

improved lighting. They ranked it first in importance—even above air conditioning—on the list of controlled working conditions.

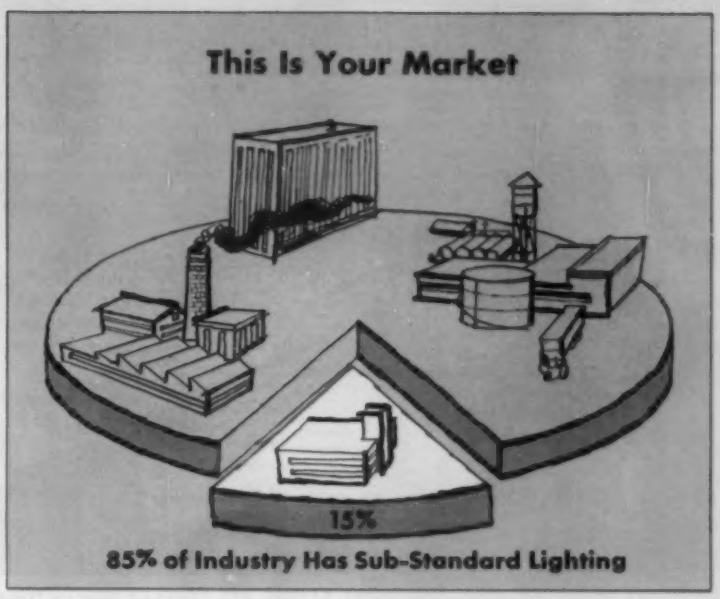
Aware that today's factory hands are rapidly becoming "factory eyes" they have begun asking their power companies to work out good lighting installations for them. They may not know that good lighting reduces nervous muscular tension and will conserve the energy of their men. They may not know that certain eye muscles become three times as fatigued under a low light level (1 ft-c) as under a high (100 ft-c) level. But they do know that good lighting fosters higher plant efficiency, better employee relations, and job safety. And they know it cuts down on rejects too. So plant managers want good light.

A NEMA survey several years ago showed that 90% of the prospects who put in new lights took the first step alone. Often they suddenly realized the need for lighting in their own store or plant after being impressed by the good lighting in another store or plant.

But an enormous gap lies between this desire for good lighting and the actual finished installation. The plant manager travels over many unfamiliar roads while moving from idea to installation. Too often he blunders upon a rocky detour that leads him to an inferior end-result.

This situation is being corrected rapidly, however, for utilities are putting new emphasis upon lighting. An EEI survey disclosed the need for hard-hitting promotional mailing pieces. EEI subsequently prepared seven two-color mailers for utilities to distribute. Realizing that these mailers may form only a small part of a larger promotional program, EEI also compiled a bibliography of promotional pieces complete with titles, prices (when available), and names and addresses of sources.

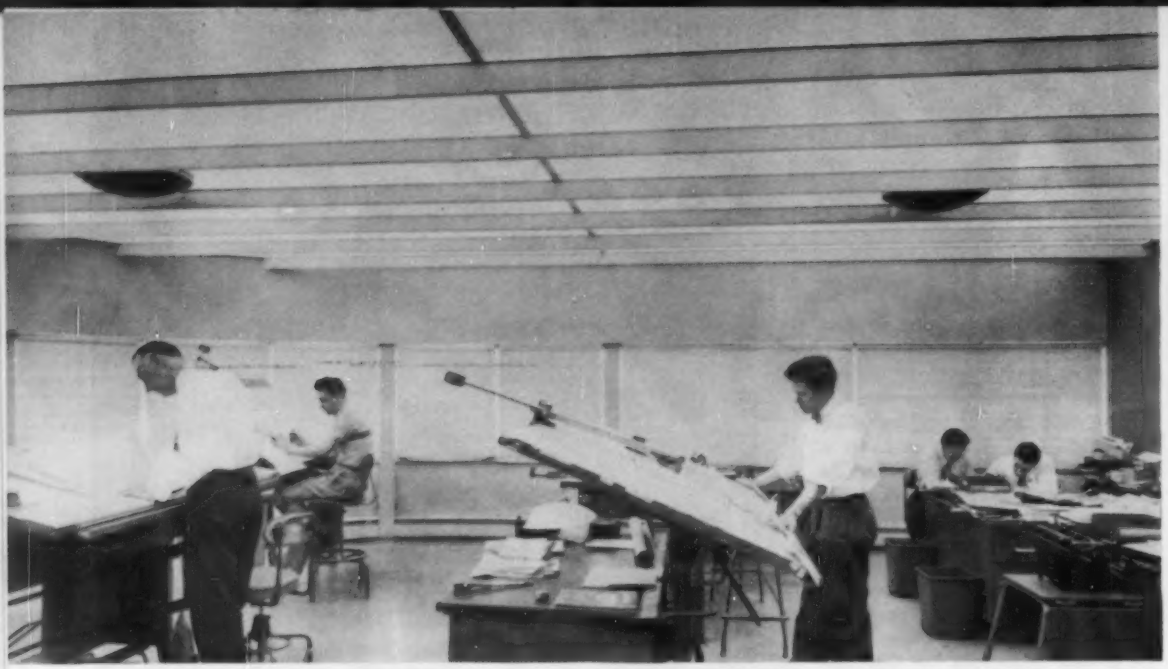
NEMA, meanwhile, has organized the certified lighting program which forges into a close-working partnership the three sales elements of a new lighting installation: the utility, the contractor, and the distributor. This move already has sealed off some of those rocky detours that can lead plant managers astray. Local lighting bureaus chartered by the National Lighting Bureau in New York, have sprung up in five cities already, and will be operating in four others by the end of the year.



Tools for Selling Industrial Lighting

EEI—Seven two-color mailers at $3.25 per 100. Two-color, 15-page booklet: The Facts of Light in Modern Industry at $14 per 100. For your information: A Catalog of Promotional Material for Commercial and Industrial Lighting; free. Write: Commercial Dept, Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

NEMA—Mimeographed folder telling how to establish a local lighting bureau and certification committee in your area. It gives tips on training lighting salesmen. Student texts, supplementary student material, and classroom visual aids are available from Laurance Messick, Manager, National Lighting Bureau, 155 East 44th St, New York 17. He will quote rental fees.



ILLUMINATED CEILING AND ACOUSTICAL BAFFLES ARE POPULAR ITEM IN TODAY'S COMMERCIAL LIGHTING

COMMERCIAL: Today's Largest Source of Sales, It Offers The Highest Return per Kw

Utilities look for continued high sales from these sources:

- **Boom in suburban shopping centers**
- **Downtown modernization programs**
- **Higher levels of illumination among existing customers**

But these could be their stumbling blocks:

- **Failure to get the contractor to "sell up" his lighting jobs**
- **Not enough personnel to make architect, builder contacts**

Commercial, along with industrial, is the kingpin of today's lighting sales. The boom in store, office, school and institutional construction since World War II has pulled lighting right along with it. And to utilities the market looks as good or better now as when the shooting stopped.

Commercial installations, and street lighting, are said to deliver more estimated annual revenue per kw connected than any other lighting load. EEI points out that by selling just one additional kw to each commercial customer the industry could jump its annual revenues by $278 million.

Perhaps the very reason it is a lush market has worked to its disadvantage. The big new jobs going up have gotten the bulk of sales attention. The lucrative relighting market that exists among small retail outlets has suffered accord-

Tools for Selling Commercial Lighting

National Lighting Bureau (NEMA)

Program for up-grading commercial lighting installations by certification. Local activities are directed by local Lighting Bureau, chartered by national organization, and organized under auspices of electric league and/or utility and other industry allies. Aimed primarily at contractor, it provides text materials and teaching props for setting up training courses for contractors, other lighting salesmen.

Prices and other details available from: Lawrence Messick, Manager, National Lighting Bureau, 155 East 44th St, New York 17, N. Y.

EEI Planned Lighting Program

Series of seven two-color mailers and one store lighting handout booklet for purchase and distribution to customers by utilities

Prices . . .

$3 per 100 for each mailer

$16.50 per 100 for booklet

(10% additional charge for non-members of EEI)

Contact . . .

Commercial Department, Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

ingly, National Lighting Bureau says that commericial lighting is no better, maybe worse, than industrial where only 15% of installations meet IES standards.

With commercial building slated to keep up the frantic pace of the last ten years, utilities are not only after the lighting markets, but are developing some themselves.

American Gas & Electric Co, for example, sponsors an "Operation Main Street" program to modernize downtown areas in the towns it serves. It is getting encouraging response from chambers of commerce and other civic groups. The sales pitch: Appearance of a town greatly influences industrial concerns shopping for new plant sites. This way it not only sells lighting, but does a community development job at the same time. AG&E figures that one new plant with 100 employees means at least $½-million dollars increase in money coming into a community.

It is in store lighting that utilities see great possibilities. Illumination levels are still pitifully low, even though some supermarkets and department stores today are going as high as 100 to 150 ft-c.

The move to the suburbs and the rise of shopping centers is one case in point. "They may be creating a marketing revolution," says a GE specialist, "but they certainly aren't creating any lighting revolution." He gave as an example a recent survey in Cleveland where some stores were operating with lighting levels of only 30 ft-c.

Sell As Sales Buildup

He believes the solution to this lies in the shopping center's management. "Since in most cases the management gets a percentage of the take from his tenants, he's naturally anxious to see a rising sales curve. So sell him better lighting on the strength of its ability to boost sales."

Other opportunities he sees to sell more store lighting:

- Emphasis lighting for better display of merchandise.
- Lighting in the daytime. This not only acts as an attention getter, but cuts out the "mirror" effect of show window reflection which usually encloses a darkened store.

While the profit motive has done most to sell store lighting, comfort, efficiency and morale have done as much to sell better office, school and institutional lighting. Offices, in particular, are recognizing it as an essential tool.

The federal government recently wound up tests on seeing conditions and efficiency in its post offices, census bureau and internal revenue offices. Conclusions: Production was upped three to eight per cent; there was less absenteeism, less employee turnover, and increased quality of work with fewer errors.

What does a three to eight per cent productivity increase mean? GE says it can mean a lot. It tallies up these figures:

- Typical office costs are $30 per sq ft per year;
- Payroll is heaviest expense item—about 83% of total;
- A one per cent increase in employee productivity, alone, is worth 25¢ on the basis of payroll cost.
- With an increase of 25¢ worth of employee productivity per sq ft, or more, the improved lighting that made the increase possible, can pay for itself in a short time.

While the rewards of commercial lighting appear rich, there are many in the industry who express doubts about enough trained personnel to reap it. An Electrical World study of four years ago showed an average of only one man to service every 3,700 commercial customers. This condition may be improving somewhat as more reserve capacity becomes available, and utilities get in the swing back to selling.

Look At Revenue A Fully-Lighted Store Can Bring

Based on the average store in the U. S., utilities today are getting from $80 to $120 annually per store for lighting. Here's example of what can happen when a good general lighting job plus emphasis lighting is installed:

General Lighting: $165

Case Lighting: $125

Interior Spot lights: $195

Complete Lighting Job $485

This is 5 to 10 times the revenues that utilities now realize

Plus $380 worth of window and entrance lighting makes a total of $865 per year

(Figures developed by General Electric Co Lamp Division . . . Based on 2¢ rate and 3,000 hr annual use)

RESIDENTIAL: It Is the Richest Market of All, and Most Promising As a Load Balancer

- **Needed are better ways to "mass-sell" home lighting, because . . .**
- **Continued high construction starts plus "vertical" growth in existing homes make it lighting's juiciest plum**
- **But its heterogeneous character makes it toughest to reach, and most difficult to evaluate**

"There's got to be a revolution in sales techniques and promotion if we're to get out of home lighting what we should. What's needed, number one, are some mass-selling methods that really work."

This was the corridor comment of a sales executive at a recent conference. It pretty well sums up most utility thinking.

Today's home offers lighting its richest sales plum. But it is also the toughest to reach. Commercial and industrial customers are limited in number and generally well defined. Personal contacts can handle the bulk of the sales work.

Not so with residential customers. "At $3 a call, it becomes financially impossible to knock on the door of every home on our lines," says R. L. Coe, Union Electric's residential sales manager. The alternatives? Most utilities, realizing that a visual product like lighting requires visual media to sell it, are turning to television plus greater reliance on group demonstrations and displays.

Some examples:

• In Indianapolis, retailers, decorators, teachers and the press work with Indianapolis Power & Light Co in a community-wide cooperative program to merchandise home lighting. In last fall's Lamp Fashion Festival, consumers exchanged tags from newly-purchased Beauty Plus lamps for free lamp bulbs. Behind a barrage of advertising, displays and publicity, stores reported sales up 15 to 50%. Program is described in a new booklet to be released by General Electric Co this week.

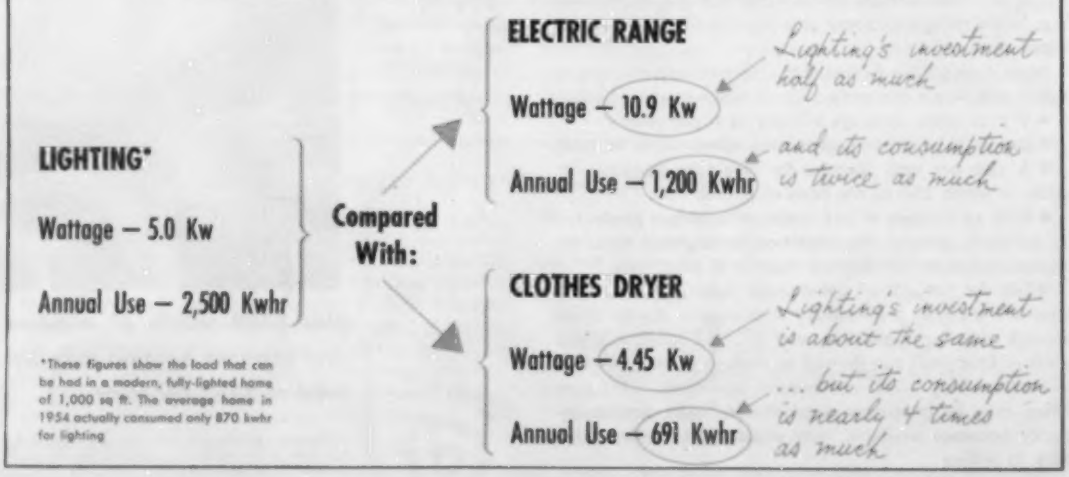
• In St. Louis, Union Electric runs testimonial ads from owners of relighted homes, recently wooed local home builders by taking a plane load of them to a manufacturer's lighting clinic. Other methods: $1 to retail salesmen for each certified lamp sold; a series of lighting forums for builders and architects. Its 28 home service girls give group demonstrations and make home calls on some 30,000 customers a year.

• Cincinnati Gas & Electric Co uses its "Ann Holidays" (home service girls) for home and group demonstrations, and to prepare lighting layouts for architects, builders and home owners. It also sets up lavish exhibits in its office lobby, ties lighting in with civic improvement campaigns.

• Dayton Power & Light Co sponsors a series of eight-day Lamp Fix-it workshops in district offices, and runs heavy Beauty Plus advertising schedules. It recently put planned lighting and 100-amp service into a project of 493 new homes.

Besides promotion, one manufacturer contends that the utility could function profitably as a catalyst to bring the buyer and seller together. "It could help the distributor hold sales training meetings with dealers and contractors," he says. "More of them could get home builders to plug

How Does It Compare With Some Other Loads?


LIGHTING*
Wattage — 5.0 Kw
Annual Use — 2,500 Kwhr
Compared With:
ELECTRIC RANGE
Wattage — 10.9 Kw
Annual Use — 1,200 Kwhr
Lighting's investment half as much
and its consumption is twice as much
CLOTHES DRYER
Wattage — 4.45 Kw
Annual Use — 691 Kwhr
Lighting's investment is about the same
... but its consumption is nearly 4 times as much

*These figures show the load that can be had in a modern, fully-lighted home of 1,000 sq ft. The average home in 1954 actually consumed only 870 kwhr for lighting

Some Ways Utilities Mass-Sell

DAYTON P&L: Lamp Fix-it workshops in district offices provide service for customers, and set stage for new sales

PUBLIC SERVICE CO of INDIANA: This fully-lighted model home in Madison pulled over 1,000 prospects to open house

General Electric Co photo

UNION ELECTRIC: It puts heavy emphasis on outdoor lighting like this to open big new source of sales and revenues

CINCINNATI G&E: "Miss Beautify" puts spotlight on lighting during spring "Clean-up, Paint-up, Light-up" campaign

properly lighted model homes, too, the same way they do with appliances."

Utilities, for the most part want the home lighting load. Says Cincinnati G&E's J. R. Hartman: "Residential lighting provides more revenue to our company per dollar of customer investment than does any other residential use of energy," (see chart).

Lighting's share of this load is declining, however. In 1937 it was nearly 39%, reports the Westinghouse survey. Now it is 30-31%, and by 1963 it will be but 27% as more large-use appliances move into the home.

Even so, within the next three years it is expected to replace commercial as the largest lighting market of all. Its energy consumption by 1963 will reach some 68.3 billion kwhr. And, notes the survey, "if economically practical methods of mass promotion are found, or if utilities decide they can afford greater sales expense to reach this important segment of customers, this forecast could easily be surpassed."

Tools for Selling Home Lighting

Beauty Plus Lamps

Nationwide program, launched last summer, to promote portable lamps which conform to industry-specified standards of illumination and operating performance. At present some 100 utilities endorse and actively promote purchase of portable lamps bearing the Beauty Plus tag.

Information on promotional materials for utility and dealer use available from Don Julien, Beauty Plus Lamp Council, 2116 Keith Building, Cleveland, Ohio.

American Home Lighting Institute

Organization of home lighting fixture manufacturers, it will sponsor American Home Lighting Fixture Month, a special country-wide promotion next October. Managing director of the Institute is Minita Westcott, 425 North Michigan Ave, Chicago, Ill.

Lamp Manufacturers, Illuminating Engineering Society

Literature, mailing pieces plus other sales, technical, and educational aids offered periodically.

What Does It Cost To Sell Home Lighting?

- **Utilities have long had a tough time appraising the lighting load, and determining how much money can be spent to get the business**
- **Here is method used by one company to guide its marketing plans**

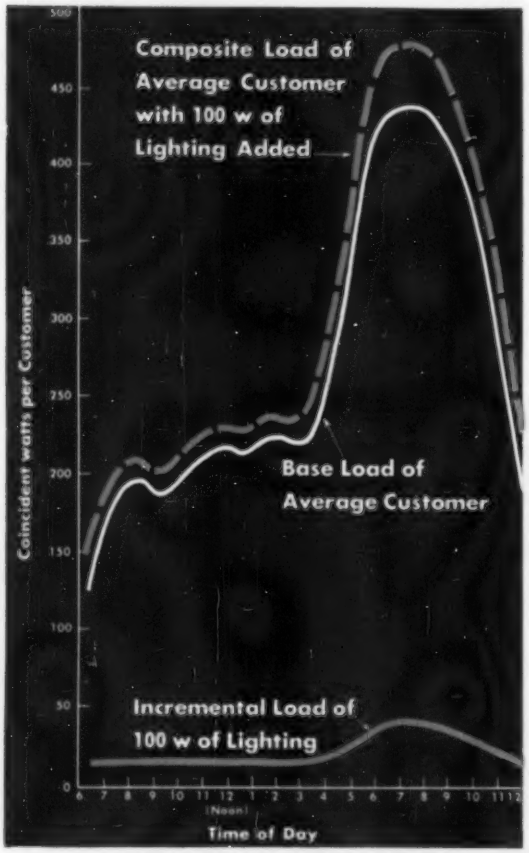
S. E. WERTHEIM and C. T. LOSHING, Technical Studies Section, The Cleveland Electric Illuminating Co, Cleveland, Ohio

How much can a utility spend to sell home lighting? A recent study by Cleveland Electric Illuminating Co puts this question a step closer to its solution.

At CEI, the figure is 32¢ per customer per year, assuming each customer increases lighting 100 w and uses the new load 1,000 hr during the year. The figure drops to 8¢ when lighting increase is 50 w and load usage 800 hr.

With these figures, CEI marketing men can come up with the amount to spend on promotion. Example: Suppose they set their sales goal at 100 w per customer with 1,000 hr of use. They know immediately that $140,000 can be spent on promotion. It is simply a matter of multiplying the proper per-customer figure (32¢) by number of CEI residential customers (440,000). If the aim is a 50-w increase and 800 hr use, they can spend $35,000.

Purpose of the study is to provide a guide for marketing decisions which produce an adequate return.



How CEI Gets Its Figures . . . CEI's method can be duplicated by other interested utilities.

Three basic "ingredients" are necessary:

1. Determining characteristics of the incremental load as well as the base load to which it will be added.
2. Estimating incremental investment cost and expense of handling the new load.
3. Estimating incremental revenue derived from the new load.

Most of CEI's data came from studies conducted in the past few years. Some work, however, was necessary to convert it to an incremental basis for appraising costs of promoting lighting. Here is how it was done:

Load and Revenue . . . Lighting load was added in 100-w blocks to base load of the average CEI residential customer. It was assumed this incremental load would be used 1,000 hr a year. That's an 11.4% annual load factor or about 2¾ hr of use per day. Annual bills before and after adding 100-w block of lighting load were then totaled up. The difference was the incremental revenue.

Investment Cost and Expense . . . As shown at the left, the composite "shape" of the average customer's incremental load was added to composite "shape" of his base load. From this, the increase in the average customer's max kw demand was determined.

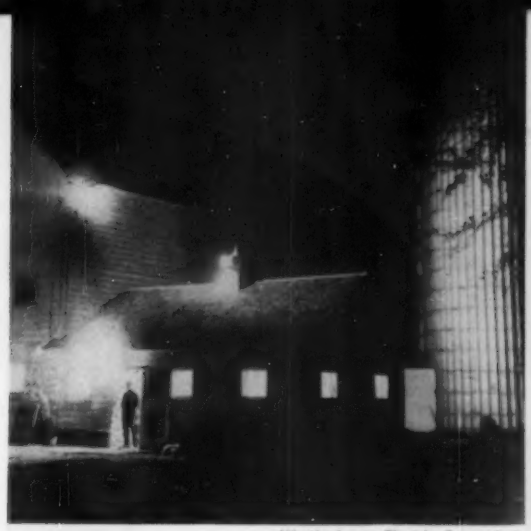
From this base, the cost of additional transformer capacity necessary to serve the new load was figured. The increase in kw demand at the time of feeder-and-substation max was used to calculate the investment necessary in these facilities to serve the new load. The unit cost of various facilities was not the present average unit cost, but the best estimate of what the unit cost would be on an incremental basis. In general, the incremental unit cost ran about 80% of the present average unit cost.

A similar procedure was followed until all investment necessary to serve the new load had been evaluated. An amount large enough to cover working capital needed also was included.

Much the same pattern was followed to determine the expense incurred in handling the new load. The element most nearly controlling the expense was used to assign the proper incremental expense.

The incremental expense subtracted from the incremental revenue yields the return provided by the new load. This incremental return then can be divided by incremental investment to get an incremental rate of return excluding promotional expense.

Suppose it's 10%. If 7% is considered an adequate return on investment required to handle the new load, then the return can be reduced by 3% of the incremental investment and still maintain adequacy. In this case, return is after income taxes. Since sales expense is tax deductible, CEI can spend approximately 6% of added investment to acquire new load.



Westinghouse Electric Corp. photo

WHERE FARM SALES PREVAIL: LIGHT FOR SEEING . . .

National Farm Electrification Bureau photo

AND LIGHT FOR BETTER PRODUCTION

RURAL: Though Ripe for Better Lighting, Its Future Still Remains Uncertain

- **As the farmer becomes more industrialized, his seeing tasks multiply**
- **At same time, light is finding new production uses**
- **But rural lighting at present lags 50% behind urban standards**
- **What lies ahead depends mainly on how well utilities carry out programs to step up all farm power use**

Of all the markets for lighting sales, the American farm is probably least exploited.

Lighting in the farm home still leaves much to be desired (EEI says it is 50% behind average urban lighting standards). Paralleling it is a great sales potential in two other areas: (1) lighting of farmstead seeing tasks; (2) use of light as a production tool.

A conscientious effort is being made by EEI (through its Farm Lighting Promotion), and the lamp bulb manufacturers to make the farmer more aware of the importance of sight and good light to his kind of business. They point out that today's farmer, besides being a producer, is taking on other functions, like that of processor and marketer, in his attempt to gain a bigger share of the food dollar. As a result he is becoming more industrialized. They see in this more seeing tasks for the farmer, and new sales opportunities.

How to sell him? "Light the chore, not the barn," declares one manufacturer. "Slip in the backdoor by lighting each specific chore individually. Don't scare your prospect out of a sale by trying to light up his whole barn in one swoop."

In production use, the heat lamp for brooding is probably the best established lighting application. But as the job of feeding America's multiplying mouths becomes more acute, the farmer is trying out some new lighting twists. In several regions, truck gardeners now harvest their crops at night when produce is at its best, and extra labor is available. Another farmer (picture) finds he can fatten his hogs for market faster. When he leaves the lights on, the hogs continue to eat through the night

Experts foresee greater use of light in other production processes. Among them: Control of plant maturation, reduction of spoilage, and insect control. The big question appears to be how to make farm lighting sales keep up with technical developments. Best answer: The new interest of utilities to step up all farm power use.

"If this professed determination to really sell the farmer more wired help pans out," commented one industry man, "then lighting stands a chance to be pulled in by the coattails."

Tools for Selling Farm Lighting

EEI Farm Lighting Promotion

A variety of handout and mailing pieces, radio spots, plus "Plan for Action" booklet containing suggestions for starting a farm lighting activity. Slide kit (with speaker's script), for use before farm groups, also available.

Contact . . .

Sample packet of materials and prices available from: Commercial Department, Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

State Inter-Industry Farm Electric Utilization Councils

Devoted to promoting all electrical uses on the farm, councils are now operating or being formed in some 44 states. Chairman of national organization is Fred H. Strong, Rural Electrification Administration, Washington 25, D. C.

With teaching aids like these, utilities and Better Light Better Sight Bureau . . .

Educate America to Better Lighting

- **Lighting's future will depend heavily on the use made of mass-selling techniques**
- **Here's how the industry's Better Light Better Sight program reaches millions of young people effectively, and at low cost**

EDWARD A. CAMPBELL, Manager, Better Light Better Sight Bureau, New York, N. Y.

No residential lighting sales program today can do much more than sell replacement lighting unless it stimulates in the consumer a sense of *need* for enough light, an awareness of the need for light for seeing, and a knowledge of the new types and new places for lighting. The real name for this kind of a lighting "story" is education.

Why, after all these years, does the industry need to educate the consumer about its oldest product? Two reasons: First, because it's not the same product anymore. Today, we're not lighting rooms, rather we're lighting the seeing tasks in the home.

The second reason is that it's not the same consumer anymore. We get a new batch continuously. Schools these days, for instance, get a million new pupils every year.

Educational activities can be divided into two classes: Adult groups and children of school age. Advantages of reaching the second of the two are many. They can be reached in larger numbers. The help of school teachers can be obtained to present suitable material. Reaching the school child also reaches his family and his own home in the future.

But, you may ask, are utility educational offerings acceptable to schools? To the educator, the electric utility or "lighting company" is like any other industry or business from whom he welcomes certain types of *supplementary* teaching aids.

It was because of a continuous flow of requests from school teachers to the lighting industry that the Better Light Better Sight Bureau decided to look into producing supplementary teaching materials for use in schools. Headed by H. A. Stroud, of Monongahela Power Co, who is now bureau chairman, a meeting was held with education leaders at the National Education Association in Washington, D. C. They welcomed the idea.

In the ensuing years, the bureau has produced three sets of teaching aids for use in elementary school through high school. A fourth program is now being readied for release this fall.

What Can It Do for You?

What are the advantages of such a program? First, it provides information which is in demand; second, it can provide the *means* of educating instead of requiring that company personnel do the educating; third, it can provide lighting education to large groups of present consumers and future homemakers; and fourth, it can achieve this mass education at an extremely low cost per home.

As an example, enough of the bureau's education materials for 4,000 elementary school children can be provided for $650 in the first year, or slightly over 16¢ per child. Remember, this is really 16¢ per home. In succeeding years, because many of the materials need

(*Continued on page* 149)

SAVE
ON YOUR REACTOR COSTS

10% by ordering aluminum conductor
8% more by ordering standard ratings

ALUMINUM CONDUCTOR IS NOW STANDARD on G-E cast-in-concrete current limiting reactors. Savings from the use of aluminum are being passed on to users. Aluminum has been adopted as standard because it is preferred by most utilities. Copper conductor reactors can still be furnished when desired, at a 10% higher price.

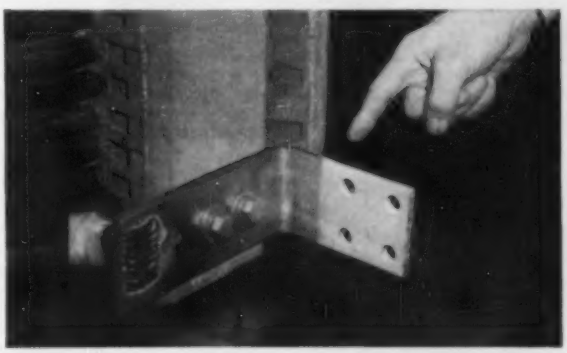
STANDARD RATINGS SAVE YOU MORE MONEY AND 2 TO 3 WEEKS ON SHIPMENT
A new RM (Repetitive Manufacture) program of standard reactor designs enables you to save an additional 8%. Stocked parts and streamlined manufacturing techniques also result in deliveries 2 to 3 weeks faster.

All standard ratings have aluminum conductor. They represent the ratings most often ordered, and include indoor and outdoor designs, single- or three-phase, for use on 4160-, 7200-, or 14,400-volt circuits. Ratings range from 100 to 700 amperes and from .10 to 2.5 ohms.

NEW ALUMINUM/COPPER TERMINAL—The standard terminal for aluminum conductor reactors is an aluminum alloy blade. However, for connection to copper bus, the aluminum terminal can be provided with a silver-plated copper end. A recently perfected technique of butt-welding aluminum to copper has made this new terminal possible. The weld is exceptionally strong, and is designed to withstand the severe stresses imposed by high current surges.

Take advantage now of these savings in reactor costs. For further information, see your G-E Apparatus Sales Engineer, or write for Bulletin GEA-6313, to Section 422-22, General Electric Co., Schenectady 5, N. Y.

BEN MONK, Manager of Transformer Apparatus Sales, points out how you can take advantage of these savings by buying aluminum-conductor reactors with standard ratings.



THE STANDARD ALUMINUM TERMINAL can be provided with a silver-plated copper end for connection to copper bus.

CONSIDERING ALL FACTORS YOU'LL WANT G-E REACTORS

GENERAL ELECTRIC

For two-wire or three-wire metering

For 100-amp extended range metering

For 200-ampere installation

General Electric's Has Been Designed

For transformer-meter installation

For two-wire 120-volt application

For off-peak control

For demand measurement

Time-proven I-50 Meter Family to Lower Your Metering Costs

PROVEN BY MORE THAN 6,000,000 I-50 METERS IN SERVICE TODAY

With the development of the I-50 watthour meter in 1948, General Electric established a new trend in meter design which has become universally accepted throughout the industry. General Electric incorporated this revolutionary I-50 design in a complete line of meters—the I-50 meter family—designed to lower your metering costs.

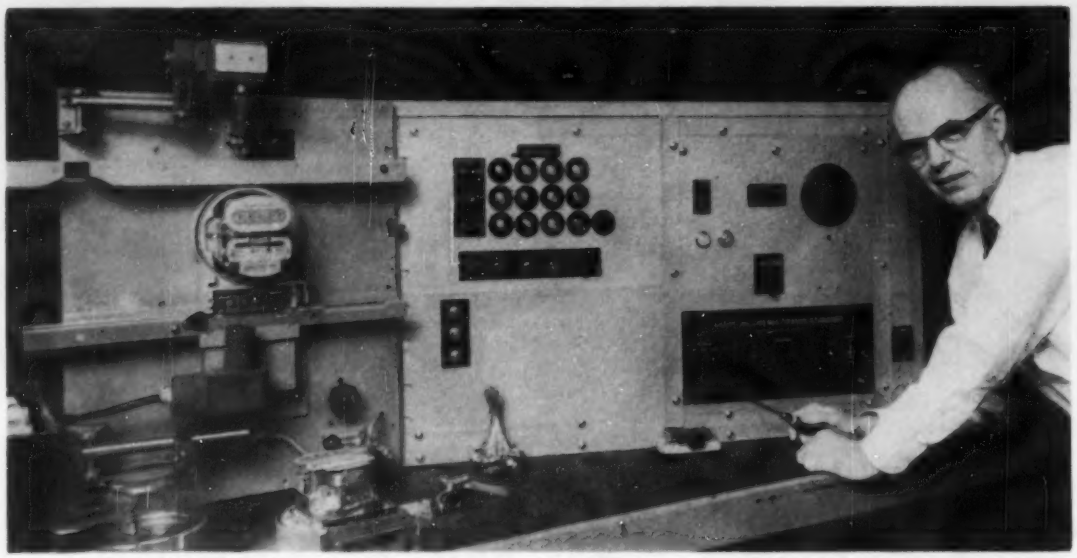
The most recent addition to this quality line of meters is the extended range I-55 watthour meter. The new I-55 meter embraces the same cost-saving I-50 features—such as magnetic suspension, co-ordinated insulation, and unit construction—that have been proven by the more than 6,000,000 I-50 meters in service today.

These facts offer the greatest assurance possible that your investment in the I-50 meter family is an investment in the future.

For more information, contact your nearest G-E Apparatus Sales Representative and request further facts on the "Importance of Metering." Or write Section 621-3, General Electric, Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



New board lets you . . .

METERING—Operation

Test Watthour Meters in Less Than a Minute

WALTER A. GREIG, Engineer, Standards Laboratory, Meter Dept, Detroit Edison Co, Detroit, Mich.

A new test board for single-phase watthour meters features a complete accuracy test on each of three test loads in less than one minute, when testing normal speed meters.

On this board, which was designed and built in the meter department of Detroit Edison Co, the accuracy for any load is measured during one revolution of the meter under test, without starting or stopping either the meter under test or the standard meter. The accuracy for each load is displayed on a separate electronic counter and is read directly in per cent registration, with a precision of ±0.1%.

The equipment is assembled in a console which may be installed in a test line or mounted at convenient height on a bench or test table. It comprises four main components or sub-assemblies:

1. A Knopp "Uniload" device in the right section.

2. A triple electronic counter in the top middle section.

3. A relay and control chassis in the lower middle section.

4. The meter test panel at the left.

The "Uniload" device contains an standard meter and is designed to load and test meters ranging in size from 2½ amp to 50 amp. The loading circuits were modified considerably to permit automatic selection of test loads by means of relays controlled by a stepping switch in the electronic counter. The three loads are: 100% load; inductive load; and 10% load.

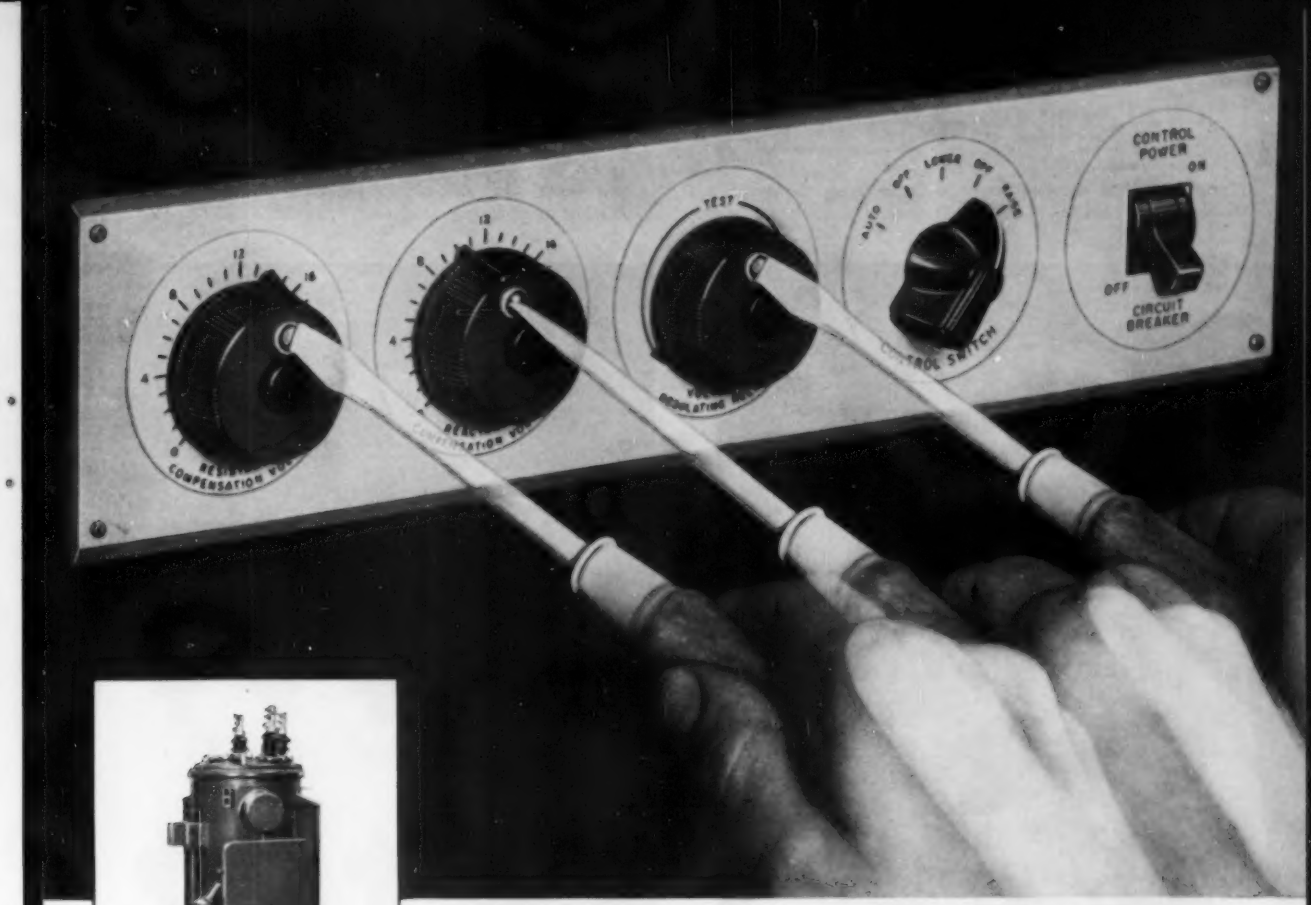
The standard meter was modified by the addition of a 500-line disc, a lamp and photo cell, and a frequency doubling amplifier, to produce 1,000 electrical pulses per revolution. Thus it is possible to have a nominal 1,000 pulses from the standard meter for each revolution of the meter under test.

The counter was designed to employ the cold-cathode decimal counter tubes GC10-4/B, wherein the radial position of the cathode glow indicates the count, as seen from the end of the tube. Pulses from the standard meter are further amplified and shaped and then led through an electronic "gate" to one of the sets of counting tubes. The electronic gate is controlled by pulses from the meter under test to be "open" for exactly one revolution, thus resulting in a nominal count of 1,000.

This count, which is inversely proportional to accuracy, is converted to an accuracy value in the following manner: Each set of counter tubes is arranged to be reset to 2,000 instead of 0, and the counting tubes are connected to subtract instead of add. Thus a nominal count of 1,000 is subtracted from 2,000, leaving a nominal reading of 1,000 which may be read as 100.0% by the inclusion of a decimal point. A meter which is 1% slow will permit 1,010 pulses to be subtracted, leaving a reading of 990, or 99.0%. This inversion involves a slight error which is under 0.1% if the meter error is under 3%.

The foregoing applies to 100% load and inductive load runs only. Since on 10% load the standard meter makes 10 revolutions to one of the meter under test, 10,000 pulses are the

(*Continued on page* 110)



ONLY G.E. GIVES YOU ALL THESE FEATURES—

Greater Accuracy

- Class 1 Control Accuracy
- Control Dial Locking
- Control Test Rheostat
- Rheostats for LDC Adjustments

Longer Life

- Opti-Life Tap Switching
- One-Piece Cover Band
- Super-Melaglyp Paint
- Nitrile Rubber Gaskets
- Electrostatic Shielding

Superior Service

- Flat Upper VRR Contacts
- Up to 120-Sec. Time Delay
- Handy Meter Shelf
- Cushion Mounted Cabinets
- Internal By-Pass Protection
- New Mercury Limit Switch
- Spring Mounted Worm.

DO YOUR FEEDER REGULATORS GIVE YOU

"Sure set" dial locking for maintaining accuracy

It's *another* of the new features in General Electric's voltage regulator line that means better regulation. "Sure set" locking screws on all dial control adjustments make sure that your control settings are held precisely accurate.

Take both line-drop compensator dials, for example. They let you make highly-accurate linear adjustments. And when you tighten the "sure set" screws, there is no chance of accidentally jarring the controls or of anyone making unintentional changes in adjustments. All regulators have this new "sure set" control dial locking feature . . . and all ratings both step and induction type.

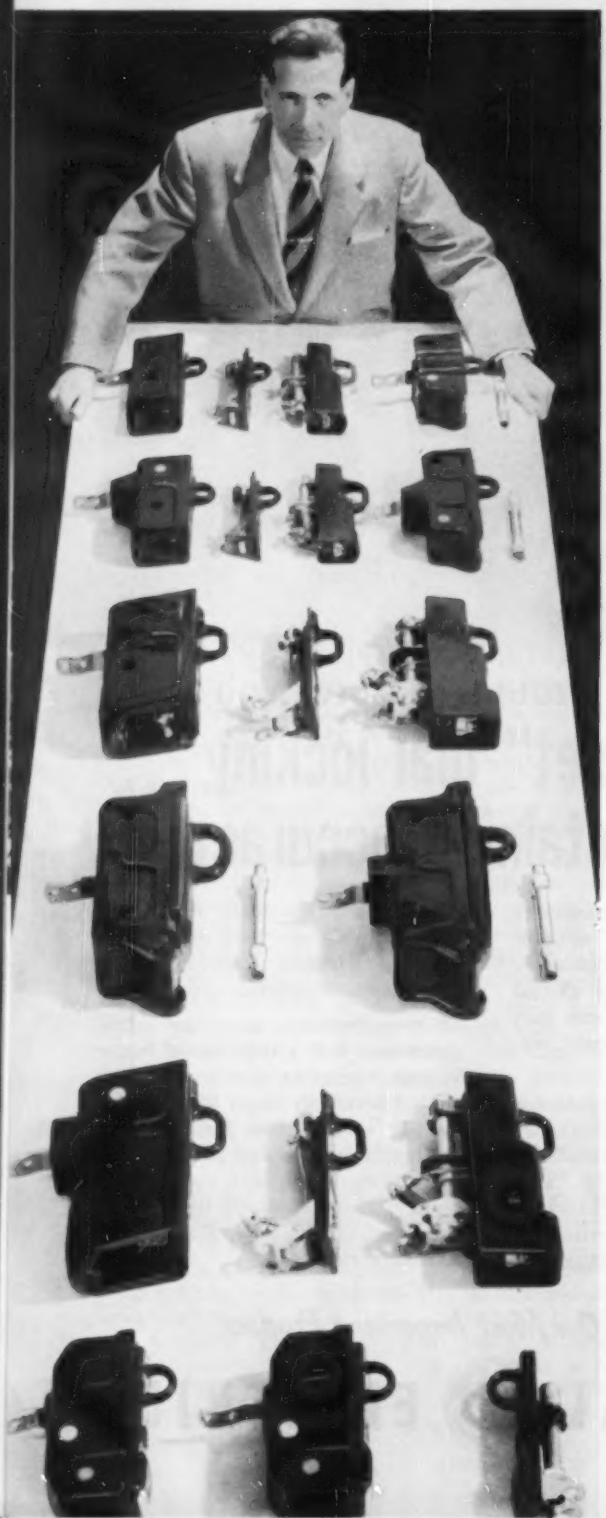
15 more features, many just introduced into G.E.'s 1955 line of feeder voltage regulators, give you greater control accuracy, longer life, superior service. Add up these features—you get the most advanced line of feeder voltage regulators, both step and induction, that is available today. General Electric Company, Schenectady 5, New York. 423-5

Progress Is Our Most Important Product

GENERAL ELECTRIC

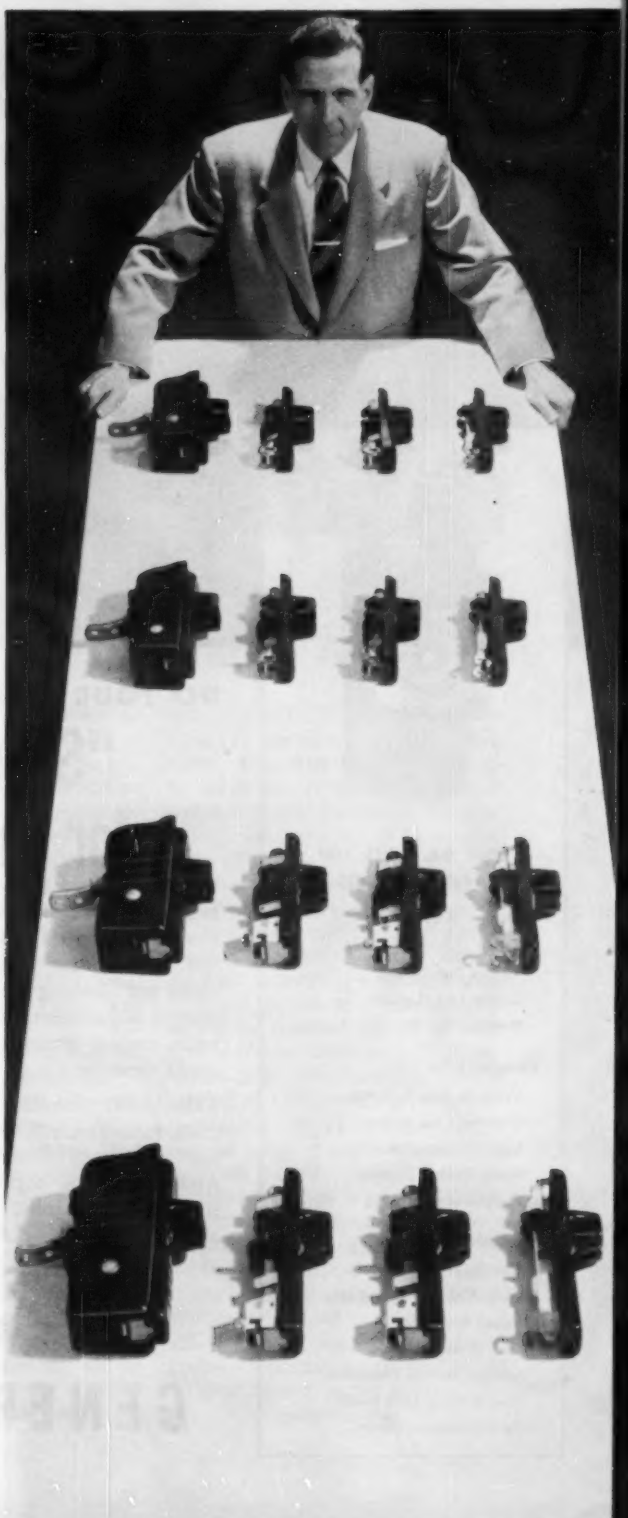
old

Stan Howard, Supervisor, Product Engineering, displays 10 housings and 15 doors of old cutout design.



new

In new design, Stan shows total reduction in housings and doors while interrupting ratings are increased.



ALL-NEW ENCLOSED FUSE CUTOUTS

now...

Stocking is simplified, interrupting ratings increased in new G-E fuse cutout line

Not since 1935, when General Electric first introduced the "family" concept of interchangeable doors, has there been an enclosed fuse cutout development like this!

ALL THE FUNCTIONS—with fewer housings. Before, it took ten housings and fifteen doors to do the job. Now, in G.E.'s all-new line, *four housings and sixteen doors meet every standard cutout need!*

Think of what this means to you and your lineman: There's less chance of error. Stocking is simplified, too. Smaller inventories mean lower handling and storage costs—and lower installation costs. All the lineman has to do is change doors to uprate the cutout.

EVERYTHING YOUR SYSTEM NEEDS. G.E.'s new fuse cutout line gives you all functions—drop-out, non-dropout, indicating, disconnect—in one basic design. You get normal-duty, heavy-duty and/or extra-heavy-duty in all ratings, to match every possible system demand. For a complete description of the new cutout line, write for Bulletin GEA-6208, General Electric Company, Section 433-9, Schenectady 5, N. Y.

LINEMEN AND ENGINEERS AGREE

The completely new line of G-E fuse cutouts has more of the features they prefer. There's good reason, too—the new design incorporates suggestions made by utility engineers and linemen to G-E sales engineers and specialists.

Progress Is Our Most Important Product

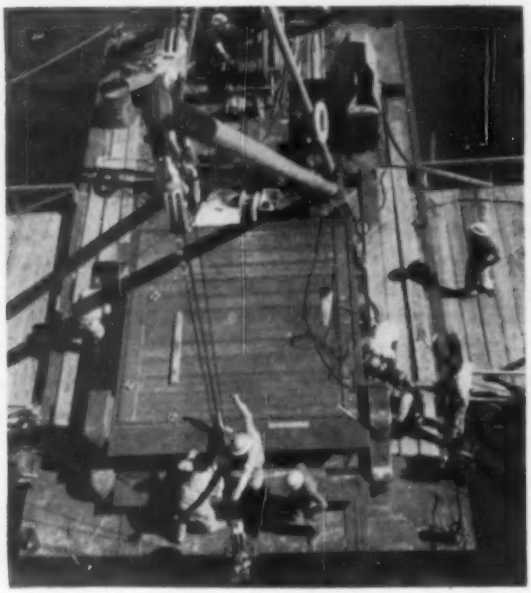
GENERAL ELECTRIC

New Meter Test Board

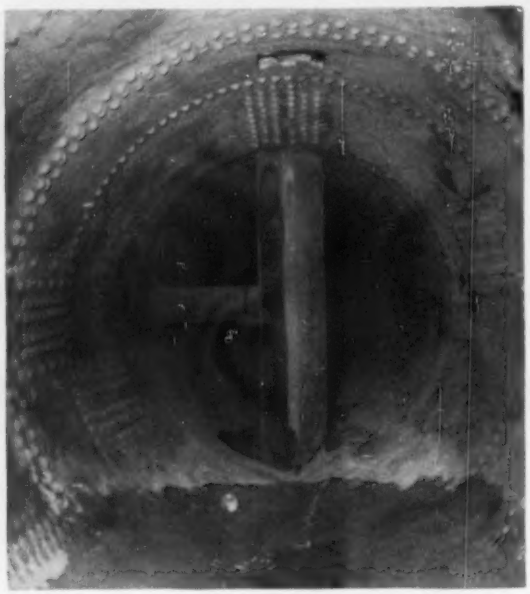
(*Continued from page* 106)

nominal number to be subtracted. The 10% load set of counting tubes, therefore, has an extra decade and is reset to 20,000. The extra decade is ignored when taking readings.

The meter test position was designed to permit rapid meter change. A short section of track is provided in which the meters slide freely, and electrical connections to the meter are made pneumatically. During the testing of any meter, the next meter is inserted on the track. At the end of the test, the air is released momentarily, both meters are pushed to the right against a stop, and the air is reapplied. Thus a meter may be changed and test started in approximately five seconds. A lamp and photo cell are provided to obtain electrical pulses from the holes in the disc.



BULKHEAD on barge was placed after removing thrash rack



PENSTOCK was cleaned and some of the rivets replaced

GENERATION—Maintenance

Pressurized Bulkhead Seals Off Intake in 200 Ft of Water

Special pressurized bulkheads placed over penstock openings nearly 200 ft below water level allowed Salt River Power District, Phoenix, Ariz., to complete an extensive $80,000 repair operation at its Horse Mesa hydro plant. Of three plans considered, use of bulkheads was the most practical to facilitate replacement of rivets in the penstocks, along with a sandblast and coating operations and relocation of the cooling water takeoff piping.

Repairs were needed because leaking rivets in the powerhouse portion of the penstocks could have caused serious damage if not replaced. Consideration was given to draining the reservoir, Apache Lake, but loss of water and generation ruled this out. Another scheme was the placing of a concrete cloak at the back of the dam. This procedure would not stop all leaks, however, and would not allow entry into the penstocks.

Under the plan that was accepted, the trash screens were removed and special bulkheads were lowered over the penstocks. These bulkheads were designed to effect maximum safety at reasonable cost. Two air-tight 12 x 14-ft bulkheads were fabricated by welding together 12-in. wide-flange beams along the flanges and sealing the ends.

Thick rubber strips were attached to each bulkhead face for a seal against the penstock opening. Large runners on each side of the bulkhead protected the strips as the unit was slipped down the face of the dam between the trash rack guides. Bulkheads were made in two sections for transportation to Horse Mesa, where they were welded and air tested. Each bulkhead weighed 8 tons.

A sectionalized steel barge measuring 40 x 22.5 ft was transported from the Colorado River to Apache Lake and then floated about 6 miles to the job site. To facilitate the work, the lake level was lowered 50 ft. After each 18 x 24-ft trash screen was removed by the barge's lifting boom, bulkheads were lowered nearly 200 ft to the penstock openings.

Then penstocks No. 1 and 2 were drained, scroll case manhole covers were removed and inspection was made for leakage. To equalize stresses in the bulkheads set up by the water pressure of almost 87 psi, air at 100 psi was maintained in the bulkheads through a manifold system fed by high-pressure air bottles.

Two penstocks were closed, and the third was left open

(*Continued on page* 114)

OPERATION VOLTAGE REPORT NO. 2

Key facts in the application of regulators and capacitors

FIG. 1

NO CORRECTION

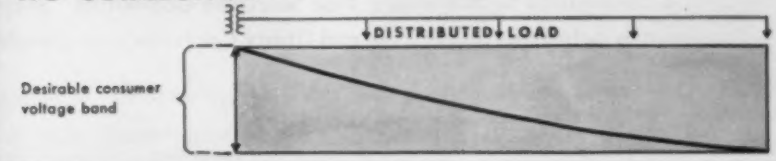


FIG. 2

ADD ONLY A REGULATOR

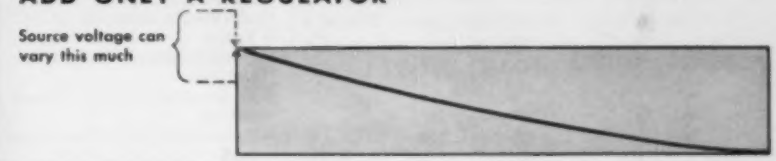


FIG. 3

ADD ONLY CAPACITORS

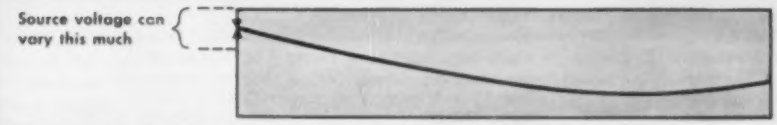
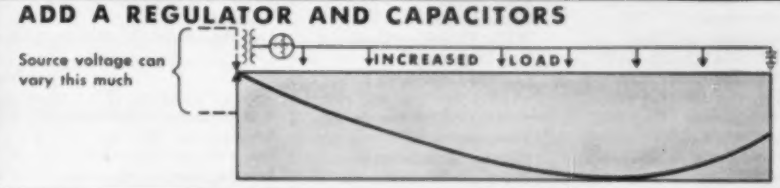


FIG. 4

ADD A REGULATOR AND CAPACITORS



What happens to system voltage when capacitors and regulators are installed?

Figure 1 shows a full-load voltage profile along a distribution feeder with no voltage corrective devices. Figure 2 shows how a voltage regulator is capable of bucking and boosting varying source voltage so as to maintain voltage within limits all along the feeder.

Figure 3 shows what happens when only a switched capacitor bank is added to the feeder: The voltage spread along the feeder is reduced and additional feeder loading is possible.

Figure 4 shows the result of the addition of voltage regulators and switched capacitors: When used together, they provide an ideal means of accurately controlling voltage and increasing system capacity for additional load. This produces satisfied customers, as well as providing the best return on system investment.

In fact, for all systems, the use of capacitors and regulators *always* results in superior voltage control and greater system load carrying capacity.

G-E engineers have just completed a comprehensive study of the problems of feeder voltage regulation. This report is the second in a series dealing with the important results of the study. If you would like to discuss voltage problems on your system, contact your G-E Apparatus Sales Engineer. General Electric Co., Schenectady 5, N. Y. 645-2

Portable demonstrator being used by G-E Engineers R. M. Butler and D. R. Samson to show effect of capacitors and regulators under variety of feeder load conditions.

GENERAL ELECTRIC

Recommended Street and Ornamental Trees

A compilation by the Shade Tree Selection Committee* presented recently before the Street Tree and Utility Conference at Cleveland, Ohio

This list of trees should be evaluated and used after careful study of site factors, variations of climate, rainfall and soil.

The list is divided according to classifications by tree characteristics. Each scientific tree name is followed by a numeral which indicates its hardiness zone. Where a tree name is duplicated, a classification cross reference is included, as "Sorbus alnifolia (4) (SC) (FC)."

Small Conventional Trees (SC)

Acer buergerianum (5) (FC)	Trident Maple
Acer Davidii (5)	David's Striped Bark Maple
Acer cappadocicum (5)	Coliseum Maple
Acer cissifolium (5) (FC)	Mitsudekaede Maple
Acer campestre (4)	English Hedge Maple
Acer truncatum (5) (FC)	Purple-blow Maple
Acer monspessulanum (5)	Montpelier Maple
Acer Miyabei (5)	Miyabe Maple
Acer griseum (4) (FC)	Cherrybark Maple
Acer capillipes (5)	Japanese Striped-bark Maple
Acer carpinifolium (5)	Hornbeam Maple
Acer ginnala (2)	Amur Maple
Acer circinatum (5) (FC)	Vine Maple
Acer leucoderme (5) (FC)	Chalk Maple
Cornusflorida (5) (FT)	White Flowering Dogwood
Cornusflorida rubrum (5) (FT)	Red Dogwood
Cornusflorida Kousa chinensis (5) (FT)	Chinese Dogwood
Ostrya virginiana (4)	American Hop Hornbeam
Fraxinus ornus (5)	Flowering Ash
Sorbus alnifolia (4) (FC) (FT)	Korean Mountainash
Sorbus aucuparia (2)	European Mountainash
Parrotia persica (5) (FC)	Persian Parrotia
Carpinus betulus (4)	European Hornbeam
Tilia cordata (3)	Littleleaf Linden
Tilia euchlora (5)	Crimean Linden
Acer platanoides "Cleveland" (3) (U)	"Cleveland" Norway Maple
Amelanchier laevis (4) (FT)	Allegany Service Berry
Koelreuteria paniculata (5) (FT)	Panicled Goldenrain
Maackia amurense (4) (FT)	Amur Maackia
Phellodendron amurense (4) (FC)	Amur Corktree
Evodia hupehensis (5) (FT)	Korean Evodia
Fagus sylvatica tricolor (4) (CF)	Tricolor Beech
Ilex opaca (5) (FT)	American Holly

Fall Color Foliage (FC)

Liquidambar styraciflua (4) Deep Crimson	Sweetgum
Nyssa sylvatica (4) Bright Crimson	Sourgum
Acer rubrum (3) Bright Scarlet and Yellow	Red Maple
Acer saccharum (3) Orange, Scarlet or Yellow	Sugar Maple
Sorbus alnifolia (4) (SC) (FT) Orange and Scarlet	Korean Mountainash
Oxydendrum arboreum (5) (FT) Scarlet	Sourwood
Acer griseum (4) (SC) Bright Red	Cherrybark or Paperbark Maple
Acer buergerianum (5) (SC) Flaming Red	Trident Maple
Quercus imbricaria (4) Russet Red	Shingle Oak
Phellodendron amurense (4) (SC) Yellow	Amur Corktree
Parrotia persica (5) (SC) Orange and Yellow	Persian Parrotia
Acer circinatum (5) (SC) Salmon Shades	Vine Maple
Sassafras albidum (4) Salmon and Red	Sassafras
Acer cissifolium (5) (SC) Red and Yellow	Mitsudekaede Maple
Acer leucoderme (5) (SC) Scarlet	Chalk Maple
Crataegus lavallei (4) Deep Plum Colors	Lavalle Hawthorn
Crataegus phaenopyrum (4) Salmon and Red	Washington Hawthorn
Quercus coccinea (4) Brilliant Scarlet	Scarlet Oak
Quercus shumardi (5) Red	Texas Oak
Sorbus aria lutescens (5) (FT) Yellow	Yellow-leave Whitebeam Mountainash
Acer truncatum (5) (SC) Purplish	Purple Blow Maple

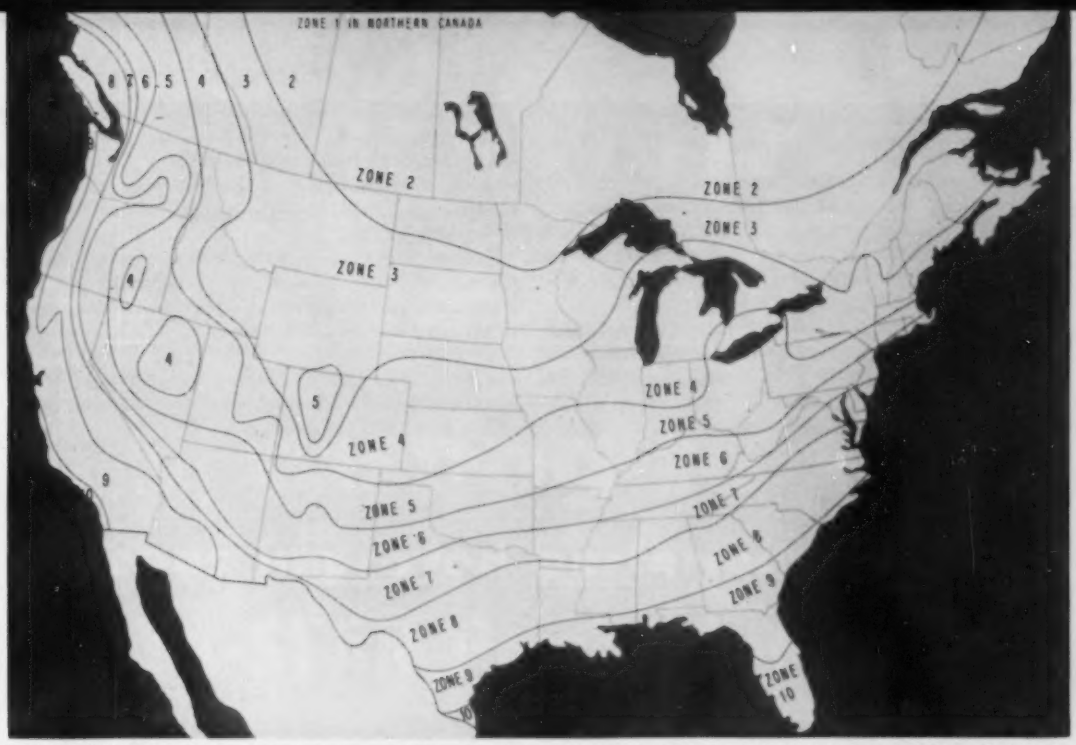
Uprights (U)
Fastigiate (F); Columnar (C); Pyramidal (P)

Acer platanoides ascendens (3) (P)	Upright Norway Maple
Acer rubrum "Bowhall" (3) (P)	"Bowhall" Red Maple
Acer rubrum "Armstrong" (3) (F)	"Armstrong" Red Maple
Acer saccharum columnare (3) (C)	Columnar Sugar Maple
Carpinus betulus fastigiata (3) (P)	Pyramidal European Hornbeam
Betula pendula fastigiata (3) (F)	Fastigiate European White Birch
Acer pseudoplatanus erectum (5) (P)	Pryamidal Sycamore Maple
Prunus serrulata "Amanagowa" (4) (F) (FT)	"Milky Way" Japanese Flowering Cherry
Crataegus monogyna stricta (4) (F)	Columnar Singleseed Hawthorn
Fagus sylvatica Dawyck (F)	Fastigiate European Beech
Ulmus carpinifolia sarniensis (P)	Wheatley Elm
Sorbus aria lutescens (P)	Yellow-leaf Whitebeam Mountainash
Ulums carpinifolia Wredei (4) (P) (CF)	Upright Golden Elm
Tilia Americana pyramidalis (4) (P)	Pyramidal American Linden or Basswood
Acer platanoides "Cleveland" (Oval upright) (3) (SC)	"Cleveland" Norway Maple
Ginkgo biloba "Mayfield" (male) (4) (F)	"Mayfield" Ginkgo
Ginkgo biloba "Lakeview" (male) (4) (P)	"Lakeview" Ginkgo
Platanus acerifolia pyramidalis (5) (P)	Pyramidal London Plane

Small Globes (SG)

Acer platanoides globosum (3)	Globehead Norway Maple
Acer saccharum globosum (3)	Globehead Sugar Maple
Cragaegus monogyna inermis (4)	Globehead Singleseed Hawthorn
Robinia pseudoacacia umbraculifera (3)	Globe Locust
Robinia hispida globosa (3)	Flowering Globe Locust

* Committee chairman is Edward H. Scanlon, consulting arborist and editor of TREES, Cleveland, Ohio. His paper was one of a number of papers covering street trees, overhead lines, and street lighting. Proceedings of the conference will be available from the three sponsoring organizations: Edison Electric Institute, Illuminating Engineering Society, and National Shade Tree Conference.



HARDINESS ZONES of the United States and Canada. The limits of the average annual minimum temperatures for each zone are: Zone 1, in Northern Canada; Zone 5, —10 to —5F; Zone 6, —5 to +5F; Zone 7, 5 to 10F; Zone 8, 10 to 20F; Zone 9, 20 to 30F; Zone 10, 30 to 40F. Compiled by the Arnold Arboretum of Harvard University, August 1, 1948. Wyman, Donald—"Trees for American Gardens;" Macmillan Co., New York, 1951

Acer platanoides "Almira" (3)	"Almira" Norway Maple
Tilia platyphyllos globosa (4)	Globe European Linden

Large Globes and Roundheaded (LG)

Acer rubrum "Tilford" (4)	"Tilford" Red Maple
Ulmus carpinifolia umbraculifera (4)	Globehead Smoothleaf Elm
Acer platanoides "Irish" (4)	"Irish" Norway Maple
Ginkgo biloba umbraculifera (4)	Umbrella Ginkgo

Flowering Trees (FT)

Crataegus lavallei (4) (FC)	Lavalle Hawthorn (White)
Crataegus phaenopyrum (4) (FC)	Washington Hawthorn (White)
Crataegus oxyacantha Pauli (4)	Palus Double Scarlet Flowering Hawthorn (Scarlet)
Crataegus oxyacantha flore plena (4)	Double White Flowering Hawthorn (White)
Maacki amurensis (4) (SC)	Amur Maacki (White)
Aesculus carnea brioti (3)	Ruby Red Horsechestnut (Red)
Sorbus alnifolia (4) (SC) (FC)	Korean Mountainash (White)
Sorbus aria lutescens (5) (FC)	Yellow-leafwhitebeam Mountainash (White)
Sorbus aucuparia (2) (SC)	European Mountainash (White)
Koelreuteria paniculata (5) (SC)	Panicled Goldenrain (Yellow)
Aesculus hippocastanum baumanni (3)	Baumans Fruitless Horsechestnut (White)
Oxydendrum arboreum (5) (FC)	Sourwood (White)
Robinia pseudoacacia x hispida—"Idaho" (3)	"Idaho" Locust (Rose-Pink)
Pyrus calleryana (5)	Callery Pear (White)
Sophora japonica (5)	Japanese Pagoda Tree (White)
Cladrastis lutea (4)	Yellowwood (White)
Cornus florida (5) (SC)	White Flowering Dogwood (White)
Cornus Kousa chinensis (5) (SC)	Chinese Dogwood (White)
Cornus florida rubra (5) (SC)	Red Flowering Dogwood (Red)
Ilex opaca (5) (SC)	American Holly (White)
Amelanchier laevis (4) (SC)	Allegany Service Berry
Prunus serrulata species (4)	Japanese Flowering Cherry
Prunus serrulata "Amanagowa" (U)	(Pinkish White)
Prunus serrulata "Kwanzan"	(Pink)
Prunus serrulata "Kofygen Zakura"	(Rose)
Prunus serrulata "Shirotae"	(White)
Prunus serrulata Sargenti (4)	(Rose)
Malus species (2–4)	
Magnolia soulangeana (5)	Chinese Saucer Magnolia (White)
Syringa amurensis japonica (4)	Japanese Lilac (White)
Evodia hupehensis (5) (SC)	Korean Evodia (White)

Dutch Elm Disease Resistant (DED)

Ulmus carpinifolia "Buisman" (4)	"Buisman" Elm
Zelkova serrata (Ulmacea) (5)	Japanese Keaki

Colored Foliage (CF)

Liquidambar styraciflua aurea (4)	Golden Sweet Gum
Acer platanoides "Faassens Black" (3)	All season form of Schwedler Norway (Deep Red)
Acer platanoides "Crimson King" (3)	All season form of Schwedler Norway (Deep Red)
Acer platanoides "Goldsworth Purple (3)	All season form of Schwedler Norway (Deep Red)
Quercus robur Condordia (4)	Golden English Oak
Acer pseudoplatanus Worleii (5)	Golden Sycamore Maple
Acer pseudoplatanus Spaethi (5)	Wine-leaved Sycamore Maple
Acer pseudoplatanus Leopoldi (5)	Variegated Sycamore Maple (Pink and White)
Fagus sylvatica spaethi (4)	Spaethi Redleaf Beech
Fagus sulvatica rohanni (4)	Red Fernleaf Beech
Fagus sylvatica Tricolor (4) (SC)	Tricolor Beech (Pink variegated)
Betula pendula purpurea (2)	Purple-leaf White Birch
Ulmus carpinifolia Wredei (4) (U)	Upright Golden Smoothleaf Elm

Bulkhead Seals Intake

(*Continued from page* 110)

to handle unexpected runoff. After No. 1 and 2 were repaired, No. 3 was closed. With the penstocks drained, mud and debris was removed, and electric heaters were used to speed drying-out. A 14 x 16-ft manhole was cut just ahead of the butterfly valve in each penstock to provide easier access and an escape hatch.

Poor plate alignment in the 45-ft penstock lengths was the cause of corrosion. Riveters reamed original 1⅛-in. holes to 1¼-in. or 1⅜-in. size, depending on the misalignment. About 165 rivets were replaced in each penstock, and 400 ft of repair welding was done.

Modification work included the transfer of 8-in. cooling water piping take-offs from the top to the bottom of penstocks 2 and 3. In the original position, air would rush into the lines and cause hammering when the turbines were started. Transfer to the bottom position was made to stop this air flow.

Interior and exterior surfaces of the penstocks, and the butterfly valve surfaces, were sandblasted and given a protective rust-proof coating. Trash racks were cleaned and covered with new screening.

Upon completion of the repairs, pressures were equalized on the bulkheads by releasing water through the new water lines. Bulkheads then were removed, and the extensive repair was completed.

METERING—Design

Cross-Phase Method May Result in Meter Test Errors

CONAN H. SPADERNA, New England Power Service Co, Worcester, Mass.

Use of the cross-phase method to provide a 50% power factor for testing extended range watthour meters can result in errors of up to ±0.2%. Magnitude of the error depends upon the reactance drops in the loading circuit and the rating of the loading transformer. The reactance drop causes the 60° phase angle to increase.

Here is the analysis that lead to these conclusions:

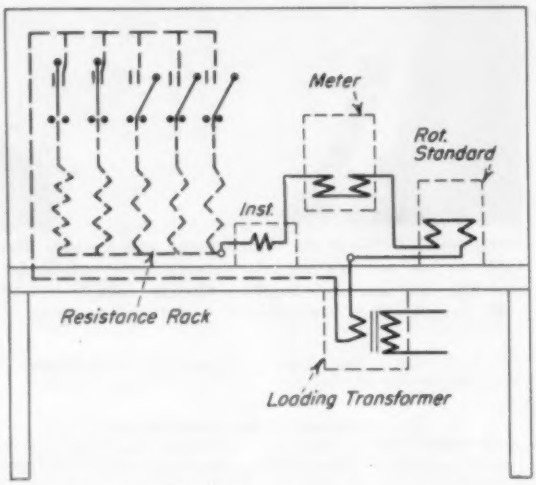
The secondary resistance drop of the loading transformer remains almost constant as the current is regulated with resistance rack. That is, to double the current two equal resistors may be switched in parallel. Thus, the product of resistance and amperes remains the same for all loads if the "inner" resistance of the secondary windings is neglected.

Contrary to that, the reactance drop changes in proportion with the current because the meter reactance stays constant. Simple examples will show how much this drop affects the phase angle.

A loading transformer with an output of 8.5 v supplies the current coils of an extended-range meter and of an rotating standard. The coil reactance of the watthour meter is about 1 x 10^{-4} henries which results in a negligible reactance drop of 0.0189 v at 5 amp. The 5-amp coil of the rotating standard with 8 x 10^{-4} henries produces a drop of 0.15 v at 5 amp. Together, the reactance drop is about 0.17 v. Because 0.17 ÷ 8.5 = tan 1°10′, the current lags behind the voltage 1°10′ more than wanted.

At unity power factor this is negligible because cos 1°10′ = 0.9998 or about 1.0. With cross phasing the angle becomes 61°10′. Its cosine is 0.4823, which is 3.5% less than 0.5, the wanted value. Because the rotating standard has a flat power-factor curve, its registration is unaffected by the angle shift while the performance of the meter under test may change by 0.1%.

With an ammeter and a wattmeter in the current circuit the error would be greater. An electrodynamometer-type ammeter has around 1.5 x 10^{-4} henries, and a magnetic-vane-type ammeter has about 9 x 10^{-6} henries at 5-amp. The dynamometer type has a reactance drop of 0.28 v, and the vane type has a drop of 0.17 v. A wattmeter with 12.5 x 10^{-4} henries causes a drop of 0.235 v.



LOADING TRANSFORMER'S rating and reactance drops in the loading circuit can cause errors ranging up to ±0.2%

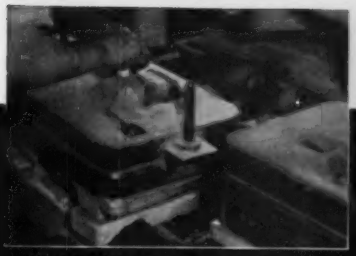
In the above setup an angle shift of about 4°30′ was measured with a phase angle meter. The power factor was lowered from 50 to 43%. Therefore, it is not recommended to load the current path with instruments when cross-phasing, unless they can be shorted.

At 100 amperes the reactance drop of the meter alone reaches 0.377 v, the phase angle is shifted by 2°30′ and cos 62°30′ = 0.4617, nearly 8% less than expected.

Therefore, the cross-phase method used with different types of ammeters and wattmeters may cause results varying by an estimated ±0.2% from correct metering. Where higher accuracy is desired, the power factor should be set by an inductive phase shifter while reading a wattmeter.

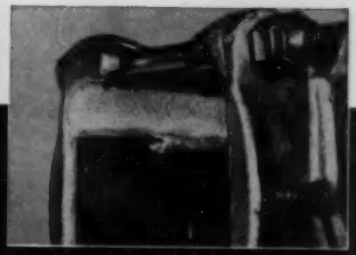
However, if cross phasing is preferred as a time saver, the loading transformer should be rated for an output voltage of 17 v or more. The larger resistance rack used with this transformer swamps out the serious reactance drops caused by 100 amp in the modern meters.

(*More How To on page* 116)



Cast-to-size power connectors . . .

. . . retain a rough, durable surface . . .



. . . that results in positive advantages

why casting to size means improved performance with DELTA-STAR Power Connectors

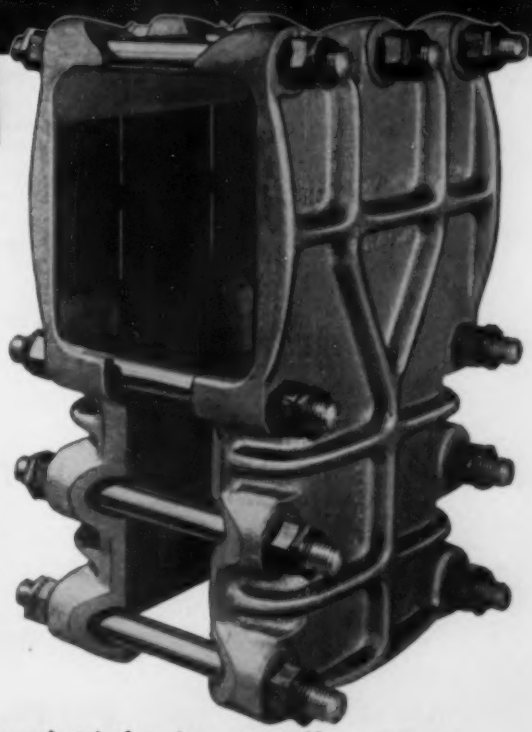
Featuring highly efficient contacts, strong gripping action and full-strength durability

Because power line efficiency depends on them, it certainly pays to evaluate the advantages offered by Delta-Star *cast-to-size* connectors.

Casting to size produces a hard, rough surface, forming hundreds of contact points. These points dig into softer bus copper. Current carried by each point is relatively small—assuring highly efficient current flow. These hundreds of contact points also provide positive gripping action.

Delta-Star's cast-to-size connectors retain full strength of the fitting because *surface* strength isn't machined off. Large cross sections and high-strength bolts on Delta-Star connectors develop strong, efficient joints. Long connector service naturally follows.

Cast-to-size advantages come to you in Delta-Star's *complete* power connector line. All types are available—copper to copper, copper to aluminum and aluminum to aluminum. Ask for Bulletin 38-E.



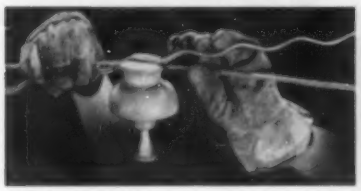
When you want the best in high voltage electrical equipment, specify DELTA-STAR

DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.
OF PITTSBURGH
2437 Fulton Street • Chicago 12, Illinois
District Offices in Principal Cities

Follow these easy steps to get EXTRA CONSTRUCTION SAVINGS AND LONGER CONDUCTOR LIFE with fine FANNER ARMOR RODS superformed

1 Select the proper rod size and number of rods in a set for size of conductor to be armored.

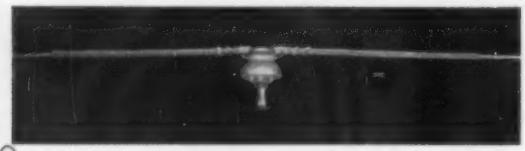


2 Hold one or two rods with centers close to conductor at the support point and rotate rods, keeping fingers held close to installed portion. (About one pitch away—not further)

3 With a rotary wiping motion of the hands install these rods for a distance of about 2 pitches each side of center.

4 In like manner install successively the remaining number of rods for the "set".

5 When all rods are installed for the initial distance, rotate entire group with rotary wrist action and continue until the ends snap into place.



6 The final installation of Superformed Armor Rods will appear smooth and uniform (no clips or clamps are ever needed).

Fine FANNER Superformed ARMOR RODS are applied easily and quickly . . . provide positive, lasting protection for overhead conductors. These precision-formed, rugged wires of special spring type metals, when applied as shown in the illustrations, minimize chances of rod distortion, assure proper rod distribution around conductor, and eliminate crowding of last rod in set. An enlarged reprint of these 6 steps to real construction savings is available to you for the asking. Ask our agents or write for copy now!

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Fine FANNER Superformed

THE FANNER MANUFACTURING CO.
Brookside Park • Established 1894 • Cleveland 9, Ohio
AGENTS IN PRINCIPAL CITIES

Transformer-Oil Tanker

(*Continued from page* 116)

transformer job empty. Oil is pumped into one or both of the tanks. Then the tanker is taken to a substation where complete filtering facilities are available. It then returns to the transformer and refills it. With smaller transformers, oil is sucked into the tanks, filtered, and pumped back into the transformer in one operation.

For testing the oil's moisture content, the truck is equipped with a 30-kv oil breakdown tester. Expansion and vacuum valves are part of the truck's equipment and serve to compensate for the oil's expansion or contraction as temperature changes during the refilling process. Nitrogen, used to compensate for pressure changes in refilling the transformer, is stowed in cylinders along the chassis.

The tanker is equipped with air pressure brakes so any kind of tractor may be used to pull it. Lights inside the tanks allow the oil to be seen. Two power reels each hold 150 ft of hose. Metal blisters slide on tracks to cover the reels and entrances to the two tanks.

DISTRIBUTION—Operation

Gas Detector Assures Safety in UG Work

Sacramento Municipal Utility District uses a gadget that looks like a Geiger counter to check for gases in underground cable vaults, thereby assuring greater safety.

(*Continued on page* 123)

New Laboratory Founded for Advanced Ceramic Research

Pardon us for seeming poetic, but we've had a dream come true!

All of our technical men -- and we have a lot of mighty good ones -- have one problem that is practically a common denominator, namely, a telephone. Just as they may be digging deep into some worthwhile investigation, a kiln in the factory will go temperamental, or a process will break down, and off they go on the run. While this is generally accepted as part of a technical man's job in industry, it is no atmosphere for serious research.

Now, another complete and independent laboratory has been established in our organization. "Laboratory" is not truly descriptive. In all the word implies, it is an Ivory Tower. It is O-B's new Basic Ceramic Research Division. It is housed in its own private building, off-limits to most people. It is filled with new, elaborate equipment. Above all else has been the careful choice of technical background and ability of its personnel. It is free and totally detached from product design or factory operation.

We believe this organization is unique in our industry. It certainly is in size, equipment, scope, and man-power. Its one purpose is to conduct advanced theoretical research in the field of Ceramics, normally -- but not necessarily -- related to high voltage insulation.

Research in its pure form is not a common commodity. It borders on being a luxury -- one of those "luxuries" that have made American free enterprise what it is today! Every O-B insulator you use makes you a partner in this project, since its support can come only from the volume of business you and the rest of the electrical industry have directed toward our company.

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

According to Stoke's Law, a given material suspended in a given liquid will settle at a rate of time determined by the size of its particles. A material consisting of a multitude of different size particles, such as clay, will gradually separate under these conditions, because the larger particles will fall out at a more rapid rate than the smaller. To demonstrate this, our laboratory prepared a set of specimens especially for photography. Note how the larger, heavier elements of some minerals quickly settle into a dense mass. In other cases, more of the material remains in suspension as indicated by greater density in the upper portions of the cylinders. This latter case would indicate a greater percentage of small particles in the sample. Combining this observed effect with knowledge of the relation of particle size to settling time, would permit evaluation of the clay's physical composition. Actual testing for particle size, as shown in another photograph, is done with a more diluted specimen which leads to greater accuracy.

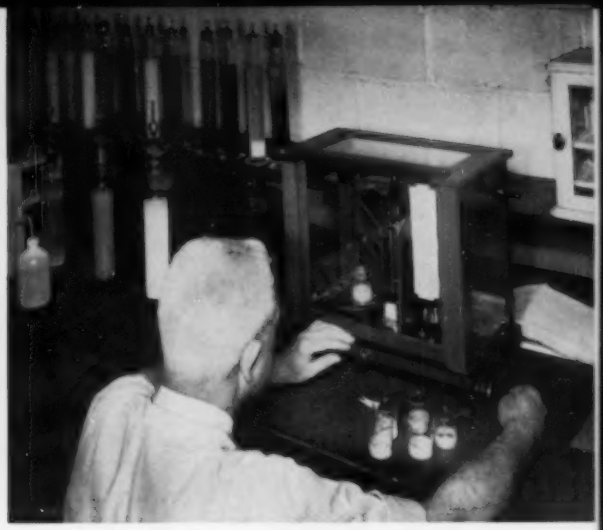
Making a Consistent Product

● Clay, a product of Nature, is highly erratic. Insulators, made of clay, enjoy no such privilege!

Clay consists of a multitude of minute particles, many of sub-microscopic size. Proportion of these sizes will vary from time to time. This variation, if undetected, can upset processing. Particle size distribution must be known, and corresponding adjustments made in certain steps of manufacture.

How we go about measuring something that can't even be seen under a microscope -- measuring it easily and routinely -- is no invention of ours. Probably every student of Physics

Three clay samples during a particle size determination. Compared with the specimens in the first picture, it is apparent that these actual test samples are highly diluted. An exact quantity of clay is mixed with an exact quantity of water to make a standardized suspension. The test remains totally undisturbed so that the only action on the suspended particles is the normal force of gravity. At specified periods several hours apart, a sample of exact volume is drawn, as shown in the photograph. This sample is always taken from a specified depth in the cylinder, as controlled by the length of the pipette tube extending down into the liquid. As a result of these test conditions, the sample represents the density of particles existing in the suspension at a certain level after a certain elapsed period of time. The next step is measurement of the quantity of these particles, shown in the following view.



Liquid portion of each sample drawn during a particle size test is evaporated in an oven. The dry residue is then weighed on a precision balance. This is the final step in determining particle size in a clay sample, as it is now known that, according to Stoke's Law, a certain volume of particles has settled a certain distance in a certain time. Laboratory data will now permit final interpretation into precise particle size. This type of test is not run "on occasion" or when some piece of trouble develops. It is a continuous procedure to guard one of the important elements of quality in the porcelain from which O-B insulators are made.

from a Variable Material...

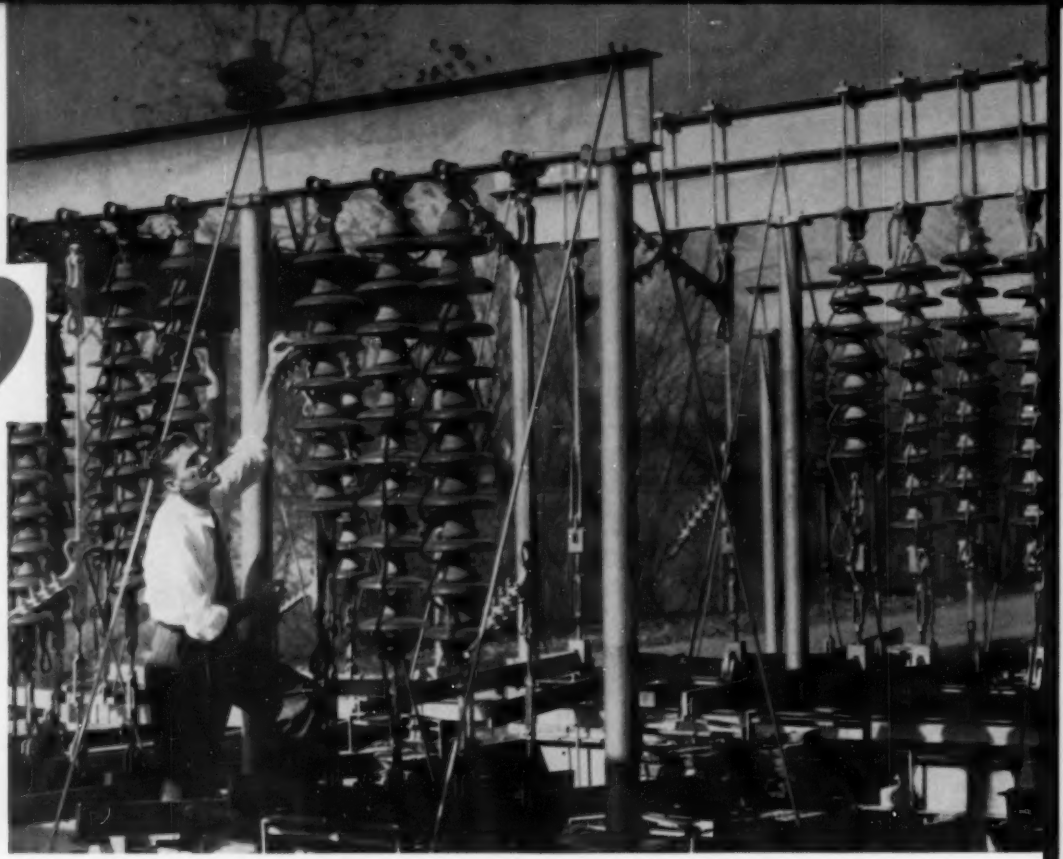
has conducted such an experiment. While the method is interesting, the important thing about it from your standpoint, as an insulator user, is *how often we do it*. "Out of sight, out of mind" can conveniently apply to the question of particle size determination in electrical porcelain. Many manufacturers might call the care we exercise largely a nuisance (It's time enough to look for trouble when you're sure you've got it).

Such a philosophy is no part of an O-B insulator. Every lot of raw material arriving at our plant receives a check for particle size. Our clays are under constant technical supervision because, as we said, these clays may be erratic while the insulators must *not* be.

This is just one of the many applications of Technical Competence to the final result of achieving the best insulator service records in the industry.

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

the heart of every Ohio Brass insulator



Here, We Meet Facts Head-on!

National Standards for suspension insulators and hardware are, by necessity, written around the "as new" condition. It would hardly be feasible for a Standard to state, "This insulator must be so-and-so after 20 years." Yet the first, the second, maybe the third 20 years declare whether you got your money's worth.

Recognizing this fact, here is a test that is now in its *second* 20 years of operation at the O-B High Voltage Laboratory. Insulators and hardware are subjected to severe industrial exposure; some under normal working loads and some under un-merciful strains. All new designs go on test as soon as they are introduced. Many of these specimens have long outlived the men who first put them up.

This is typical of our realistic product testing. It leads to *facts* that can be trusted as a basis for future development.

Testing in search of the un-varnished truth, whether it hurts or whether it doesn't, has been a big element in attaining the uniformly high quality present in O-B insulators and hardware, today. Meeting bare facts head-on is an important phase of Technical Competence, the heart of every O-B insulator.

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Lt'd., Niagara Falls, Ont.

TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

4514-H

Gas Detector

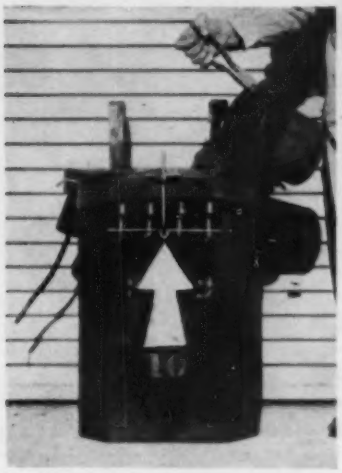
(*Continued from page* 118)

The tester has a hollow tube or probe that is lowered to the bottom of the vault. By pressing and releasing a rubber bulb, an air sample is drawn from the vault through the gadget. A dial then tells whether poisonous gases exist below.

Howard H. Davis, of SMUD's underground division, commented:

"Careful observance of details such as this one has been largely responsible for the good safety record in the SMUD underground division. In the more than eight years of SMUD's existence, we have had no serious mishaps."

DISTRIBUTION—Maintenance



Tool Holds Bushings During Sealing Job

R. L. WARE, System Supt of Distribution, Virginia Electric & Power Co, Richmond, Va.

A bushing holder developed by Virginia Electric & Power Co facilitates replacement of secondary pocket-type bushings in transformers rated from 1½ to 50 kva. Use of the tool to hold bushings securely during installation prevents compound from running through the mounting holes, thereby eliminating a subsequent cleaning job.

The holder consists of four spring-supported discs mounted on an arm. Position of each disc is adjustable to allow for variations in the different

(*Continued on page* 124)

Completely NEW . . . for Electric Utilities

Meter Installation and General Service BODIES

●Morrison's new electric utility Service Bodies and Accessories give your trucks a clean, neat appearance . . . provide maximum safety for crew and equipment . . . feature a compact design with more useable carrying space and a time-saving accessibility to tools, parts and supplies.

There is a Morrison Service Body to fit any ½ - ¾ - 1 and 1½-ton, single or dual wheel chassis. With more than 20 new design and construction features, Morrison Service Bodies are engineered and built to meet the specific requirements of electric utilities, in accordance with their recommended specifications.

Morrison Service Bodies and Accessories can completely equip any truck for any job. For meter installation and service there are Meter Trays for both horizontal and vertical compartments. They are equipped with necessary padding and hold-down straps which clamp the meter securely in place without sacrificing easy access for loading and unloading. Other available optional equipment includes material bins, rope hooks, rear bumper step and sliding top with lockable rear closure. For general service work, either overhead ladder bows or side mount ladder brackets can be installed.

In all phases of utility service work, Morrison Service Bodies and Accessories can help you promote crew efficiency and cut operating costs. Complete information on the entire line is available on request.

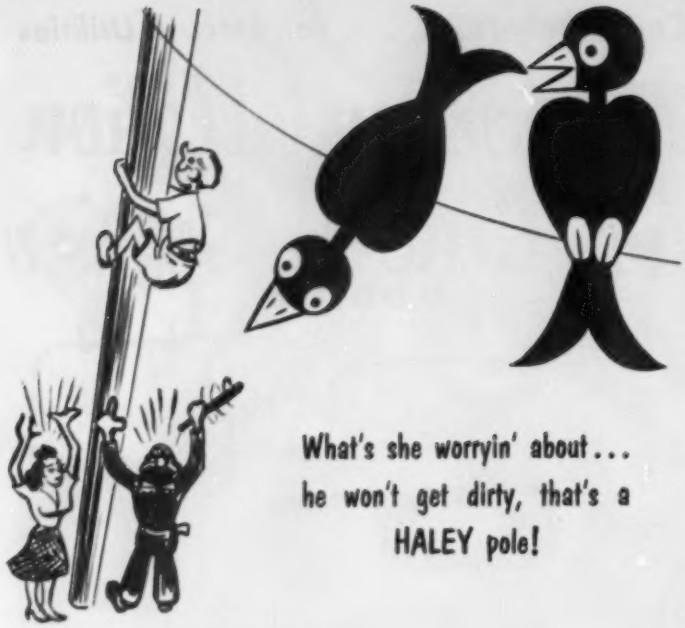
For Better Service and Greater Utility . . . Specify

Morrison service bodies

Morrison Service Body Division

MORRISON STEEL PRODUCTS, INC. • 695 Amherst St. • Buffalo 7, N. Y.

Morrison Service Bodies are stocked locally in more than 60 strategic locations



Haley's PENTAchlorophenol TREATED

CEDAR POLES and FIR CROSS ARMS

Last Years Longer • Cost Less to Maintain and they are CLEAN

HALEY poles and arms are expertly treated with deep-penetrating, powerful, long-lasting PENTAchlorophenol. This CLEAN preservative gives protection from moisture, decay and insect damage.

TWO Strategically Located Yards:
MINNEAPOLIS, MINNESOTA • FINDLAY, OHIO

R. G. HALEY & CO.
SPITZER BLDG. TOLEDO 4, OHIO

Bushing Holder

(*Continued from page* 123)

bushing spacings. This assembly is attached to clamp that is also adjustable to allow for differences in heights between the top of the transformer casings and the bushing pockets.

In use, the discs are spaced horizontally according to the bushings and secured with wing nuts. Then the ring gaskets and bushings are inserted in the pockets and rested on the discs. By positioning the adjustable clamp, the spring-supported discs are drawn up to hold the bushings snugly in place while they are sealed in with compound.

The holder was developed by George W. Norris of the company's Potomac District Substation Dept.

DISTRIBUTION—Operation

3-Phase Transformers Simplify Installation

Three-phase overhead distribution transformers installed on the Kansas City Power & Light Co system have greatly simplified construction. They eliminate separate cutouts and arresters and simplify the wiring on the pole. Time for making the installation is reduced as well as cost of supporting timbers.

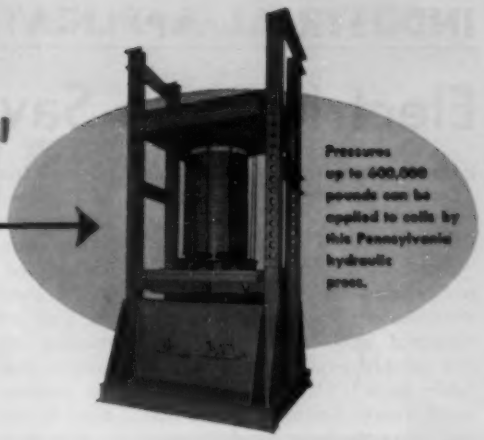
Three-phase transformers from 30 kva to 112 kva capacity are being used on initial installations. Sizes up to 150 kva are installed on replacement jobs. Initial installations of 150 kva units are not made because in case of load growth the entire structure has to be changed.

Over 15 years' experience in

"Putting on the Pressure"

is your proof that your

PENNSYLVANIA



Pressures up to 400,000 pounds can be applied to coils by this Pennsylvania hydraulic press.

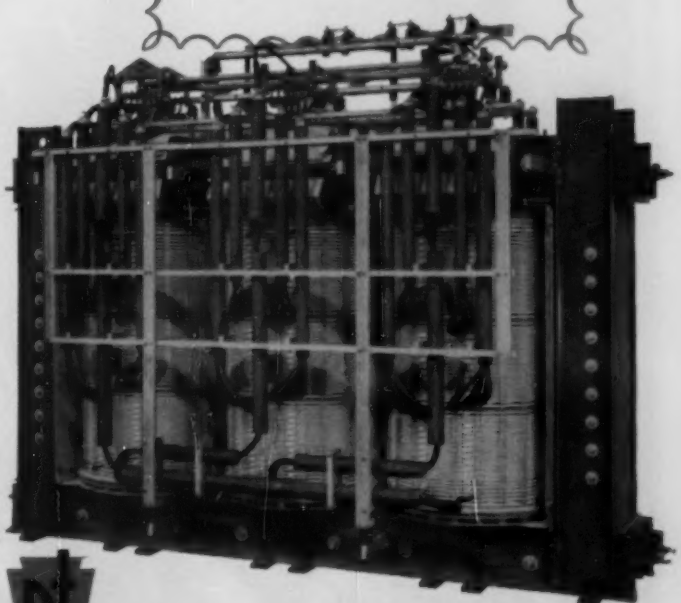
Power TRANSFORMER

will withstand short circuits

When a large power transformer is subjected to a short circuit, a force of several hundred thousand pounds may be imposed axially on its coils. Of course, these short circuit forces are taken into account in the design of each transformer. But at Pennsylvania, "proof on paper" is not enough. Positive action is taken to be absolutely certain that your transformer will withstand short circuits. Putting on the pressure is the added measure of safety engineered into every helical and pancake coil. Pennsylvania engineers calculate the total short circuit force that would be produced by a short circuit at the secondary terminals with the rated voltage maintained on the primary. Each coil is then compressed with this predetermined force. Finally, the coil is treated in such a manner that it will maintain its compressed size and shape when mounted on the core.

This idea, as well as this method of precompressing coils, was devised by Pennsylvania Transformer Company over 15 years ago. It has been a regular step in Pennsylvania's manufacturing process ever since then.

The fact that the transformer coils maintain their shapes under the prescribed pressure is your guarantee that the transformer will withstand short circuits.



Core and coil unit of 20,000 Kva, three phase transformer. Strong supports are provided at the top and bottom of the coils to keep the coils in their precompressed shapes. No movement can take place in these transformer coils, even under the most severe short circuit.

PENNSYLVANIA TRANSFORMER COMPANY • BOX 330, CANONSBURG, PENNSYLVANIA

A McGraw Electric Company Division

Electric Mole Saves $1,600 Monthly

CARSON CARMICHAEL, JR., *Power Sales Engineer, Appalachian Electric Power Co, Abingdon, Va.*

Small truck mines in the Wise and Dickenson County area of Southwestern Virginia are saving an estimated $1,600 a month with a new auger-type coal cutting machine driven by a 115/230-v, 3-hp, single-phase motor. Economies were realized through faster production, a higher price for coal mined, less waste, reduced manpower, and a savings in explosives.

With this machine, it now takes 5 to 6 sticks of dynamite to shoot the same coal that formerly required 35 to 36 sticks. Large amounts of pulverized coal formerly created in the blast are reduced. One operator estimated that he now has 8 tons, 500 lb of coal to sell for each 8 tons he formerly had.

Two men operating this machine can cut and shoot 100 tons in 9 hr. This is about the same as before, but the cost and time for loading and handling coal is reduced because more lump is produced. It is estimated that the machine cuts the total working force by one employee.

With its motor geared to its wheels, the machine drives into the mine under its own power. Then the augers are engaged by means of a clutch, and the cutting begins. These machines (available, but not yet in mass production) have 4.5-ft augers and make a 26-in. cut. But they can be outfitted with 6-ft augers. Cutting height is adjusted easily by means of a crank.

Economics . . . The following data is based on a truck mine producing about 2,200 tons per month from the Clintwood seam, which averages 4 ft in height.

Explosives, before machine was installed:

Dynamite, 10 places	$20.65
Exploders, 10 places	12.50
Cost per month	$696.15

Note: One "place" equals about 228 cu ft, and yields about 10.5 tons.

After machine was installed:

Dynamite, 10 places	$2.95
Exploders, 10 places	3.75
Cost per month	140.70
Savings	**$555.45**

Pulverized Coal: About 650 lb saved per place by using cutting machine, then shooting. Market conditions are poor, and Clintwood seam coal sells for about $3.75 per ton. But with 3.25 tons saved a day, extra monthly sales add up to..... **$275.63**

Labor: This machine generally enables the owner to reduce his total labor force by one man. Monthly savings thus run about..... **$252.00** This is non-union, but practically all truck mines pay a non-union wage. Miners work a 21-day month.

Coal Sells for More: Buyers and coal dock operators pay 25 to 30¢ per ton more for machine-cut coal because of its larger lump size. Only about 10% of coal shot from the solid is over 2-in. lump. However, about 50% of the volume of machine-cut coal is made up of 2-in. lumps.

Also, by shooting from the solid, the heat value is lowered about 300 Btu per lb. Consumers now are buying coal by the Btu more than ever. Maintaining the Clintwood seam coal at its original 14,100-Btu-per-lb value raises the price for one month's diggings about **$550.00**

Thus the total savings and benefits add up to about..... **$1,633.08**

(*More Industrials on page* 130)

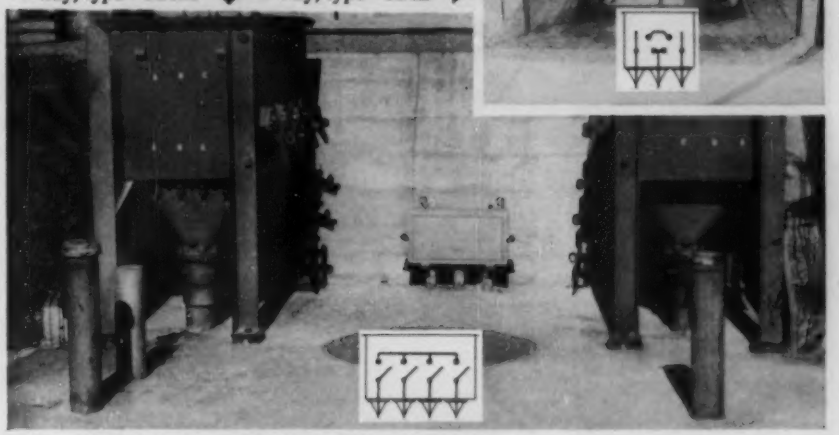
IN SOME CASES, THIS MACHINE HAS PAID FOR ITSELF IN TWO MONTHS

Avoid Costly Shutdowns In Large Industrial Plants

by Providing

CABLE SYSTEM FLEXIBILITY

4 way, type "RAM" ▼ 3 way, type "RAL" ▶



G&W 15,000 volt, 400 ampere full load break oil switches provide safe sectionalization of cable system in a large oil refinery.

Adequate flexibility has become very important in recent years as the use of underground cable systems has increased. While outages on cable systems are infrequent, the length of time on such outages may be long enough to cause considerable inconvenience.

With "RA" switches located at strategic points in cable circuits to provide flexibility, a system can be so arranged that important loads will have an alternate source of power immediately available.

Since their introduction in 1928, Type "RA" switches have had a trouble-free operating record which fully justifies their use as load break disconnects for single or multiple circuits. They are safe and reliable, combining simplicity with economy in construction, installation, and maintenance. They will operate properly after long periods of inactivity to provide fast and convenient isolation of cable sections in case of trouble and to permit rapid rerouting of circuits to materially reduce losses normally incurred through electric service interruptions. Exposure to weather extremes or complete submersion for prolonged periods will not affect prompt and safe operation when necessary. They are water-, oil-, and air-tight.

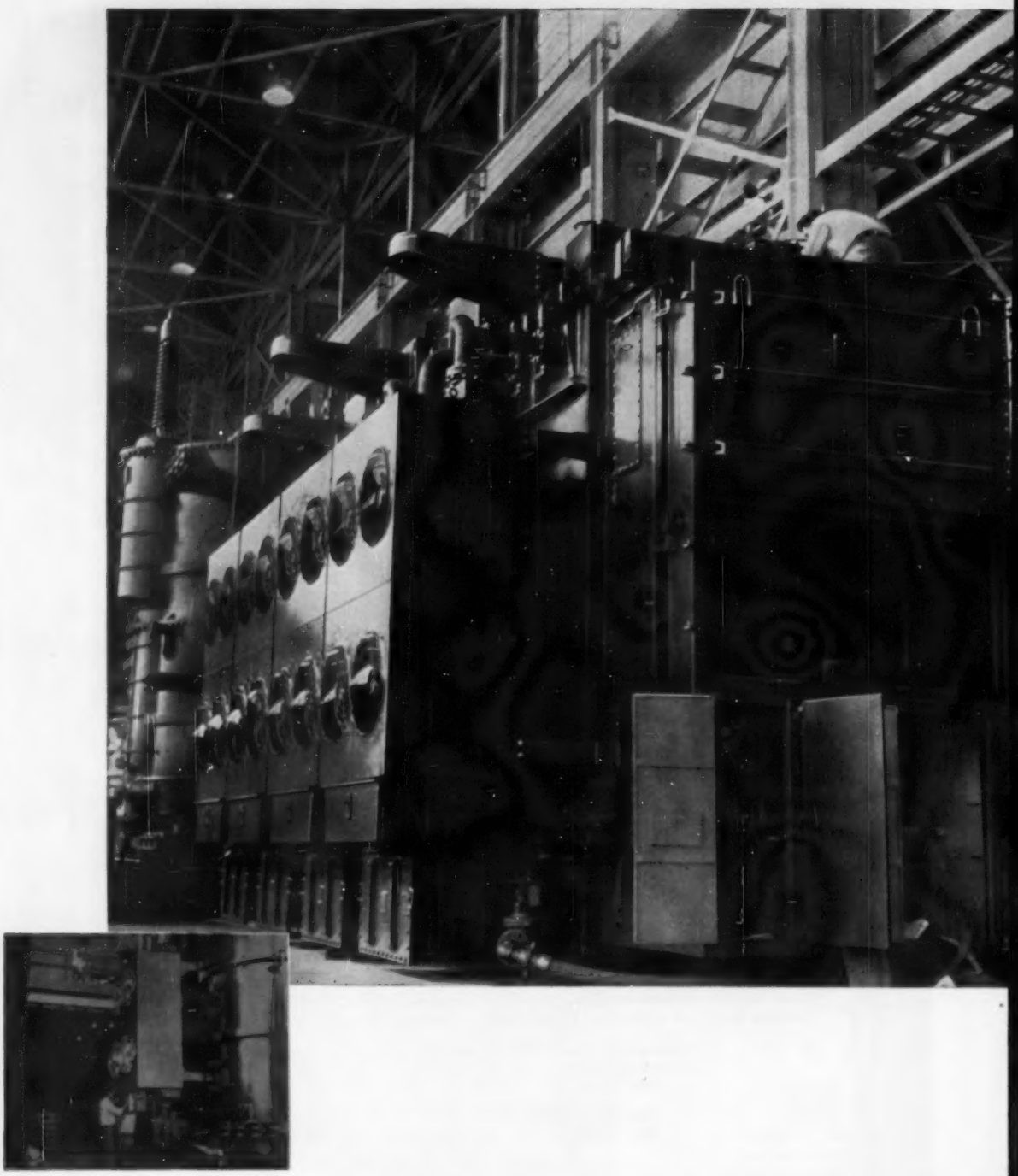
Write us for Series "DB" bulletins or get in touch with our nearest representative for further information. We will be glad to help you apply Type "RA" oil switches to your distribution system.

G & W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois, U.S.A.

Representatives in principal cities of U.S.A.
In Canada—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

50TH ANNIVERSARY
1905 1955
G&W

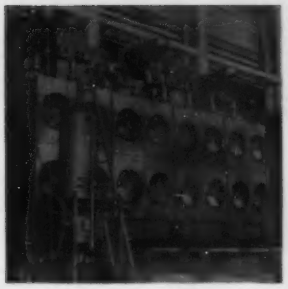
D554



M O L O N E Y E L E C T R I C

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers
Transformers • Unit Substations • Network Transformers • Constant Current Transformers

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO.



At
MOLONEY...
Abilities
and
Facilities

are combined to design, fabricate and assemble transformers for the electrical utility industry ...proven in operation to be... "Dependability at its Best."

M655-B1

C O M P A N Y

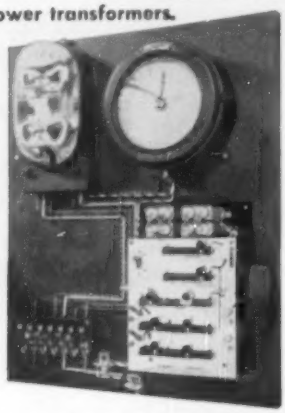
Load Tap Changing Transformers • Load Center Capacitors • Transformers For Electronics

AND TORONTO, ONT., CANADA

MOLONEY ELECTRIC

Transformer Loss Compensator *Saves you Money!*

BECAUSE it provides an accurate means of measuring the energy and demands of high-voltage services at the low-voltage side of the power transformers.



This installation at 2.3 kv saved about $2600 compared with 34.5 kv metering; it saves about $5500 over metering at 69 kv.

THE TESCO compensator adds to the registration of the watthour meter an amount equal to the sum of the iron and copper losses of the transformer bank. It may be used with practically any type of watthour meter and . . . importantly . . . no changes are made in the meter itself, either structurally or in adjustments . . . It is produced in two and three element types for use with two-element or three-element meters on any type circuit.

Some of the Users . . .

Phila. Electric Co. Penna. Power & Light Co. Texas Power & Light Co. U. S. Bureau of Recl. Public Service Co. of New Hampshire. Utah Power & Light Co. Northern States Power Co.

Get your book now
FREE
Detailed information on operation, installation, applications. Write for Bulletin NO. 63-A.
EASTERN SPECIALTY CO.
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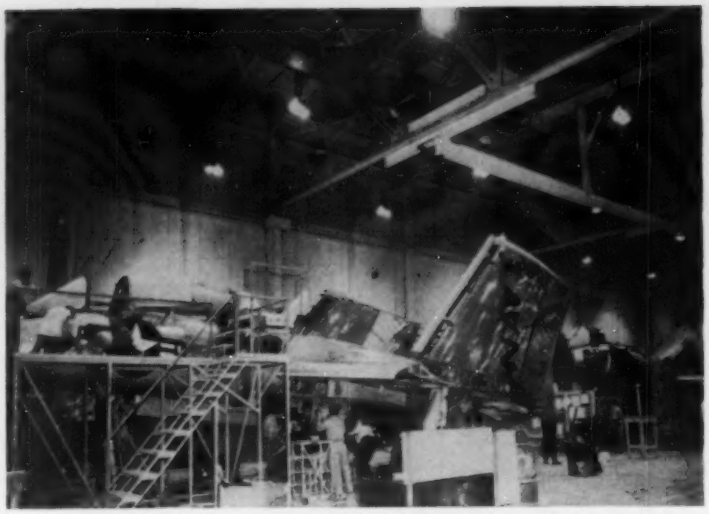


New lights with built-in reflectors double illumination . . .

. . . But Power Costs Stay the Same

LEE M. WALLACE, Regional Engineer, Westinghouse Electric Corp, St. Louis, Mo.

Reflector filament lamps and reflector mercury lamps have doubled illumination in the Dallas, Texas, plant of Chance Vought Aircraft Inc, yet the power bill has remained unchanged.

A battery of 750-w reflector filament lamps and 400-w L-H1 reflector-type mercury lamps were substituted for older 750-w bipost lamps and 400-w A-H1 mercury lamps. The only new-equipment cost of the conversion was a minor expense of installing new screw-type sockets in the old twin fixtures. Illumination on the work benches below jumped from 18 to 36 ft-c on a maintained basis after the conversion.

Narrow, Windowless Building

The Chance Vought plant, which has been turning out the guided missile Regulus and the new Navy twin-jet F7U-3, is a long, narrow, windowless building 40 ft high. A high bay area 200 ft wide and 1,150 ft long dominates the manufacturing floor. Its clear height under the trusses is 30 ft. Twelve twin luminaires are spaced across its width in 46 rows 25 ft apart.

A hangar building having the same lighting troubles was converted to new reflector-type lamps at the same time. Again the light approximately doubled after the change.

Here are three reasons why the illumination doubled without increased power costs:

- Better light utilization. The clean, built-in reflectors direct light to specific work areas in the plant, reducing the amount of "spilled" light that escaped the old external reflectors. This light, absorbed by surfaces for which it was not intended, often ran as high as 25%.
- Higher efficiency of the mercury arc tubes. The new quartz light source sheds one-third more light than the old glass arc tube.
- Better maintenance. This is possible because the reflector is built into the globe and is replaced automatically with each new bulb. Moreover, little dirt can cling to the bulb face. When the older types are not vigorously maintained, about 30% of the light output is lost at the light source itself through absorption.

Replacement Half as High

Not only was light output doubled with no increase in power costs, but also maintenance costs were cut. The reflector filament lamps need to be replaced only half as often as the older bulbs. The more-modern bulbs boast a life expectancy of 2,000 hr in contrast to 1,000 hr for standard high-wattage filament lamps. The high-efficiency L-H1 mercury vapor lamp has a life expectancy of 6,000 hr.

(*Industrial Briefs on page* 135)

Fluorescent Lighting

Costs Less When You Use

FLEUR·O·LIER FIXTURES

You can buy fluorescent lighting 2 ways: 1. Initial Low Cost — or 2. Long-Term Economy.

Fixtures that carry the Fleur-O-Lier label usually aren't found in the Initial Low Cost group. But the quality built into every Fleur-O-Lier fixture assures you of maximum Long Term Economy.

You'll get better, more satisfactory, and more economical fluorescent lighting with Fleur-O-Lier luminaires because:

1. **Mechanical and electrical construction meet rigid specifications.**
2. **Only Certified CBM Ballasts are used.**
3. **Only Certified Starters are used.**
4. **Complete photometric test data, including distribution curves and coefficients of utilization are provided to tell you *in advance* the lighting results you'll get.**
5. **Electrical Testing Laboratories, Inc., test, check and certify that fixtures conform to all the above before they can carry the Fleur-O-Lier label.**

For assured fluorescent satisfaction and economy . . .

Make Certain Your Fixtures are FLEUR-O-LIER

FLEUR·O·LIER

Manufacturers

2116 Keith Bldg. • Cleveland, 15, Ohio

Fleur-O-Lier is not the name of an individual manufacturer, but of a group of fixtures made by leading manufacturers. Participation in the Fleur-O-Lier program is open to any manufacturer who complies with Fleur-O-Lier requirements.

NORTH—Shakopee, Minnesota praised the performance of its Form 206 luminaires. The new lights provide superior illumination even in sub-zero weather.

EAST—Central Maine Power Co. accomplished their working objective of providing better street lighting economically by installing Form 206 fluorescent lights at Auburn, Maine.

NEW G-E FLUORESCENT STREET LIGHTS GAIN NATIONWIDE ACCEPTANCE

Are fluorescent street lights practical? Utility and municipal officials who have installed G-E Form 206 fluorescent luminaires are best qualified to give the answer. Their actual field experience, in all parts of the country, is summarized in the following questions and answers.

WHY USE FLUORESCENT STREET LIGHTING?

Fluorescent street lighting provides better visibility and a more even light distribution than the best engineered systems of either filament or mercury lamps. The low brightness of the light source reduces the glare and eye strain that accompanies other types of street lighting.

IS VISIBILITY IMPROVED?

Yes. Many lighting experts believe that fluorescent street lighting increases actual visibility by about one-third. Thus, a 1.25 footcandle level from a Form 206 fluorescent luminaire seems to provide the same visibility as a 1.7 footcandle level from filament or mercury luminaires.

IS THE COLOR OF THE LIGHT PLEASANT?

Yes. The whiter light furnished by the fluorescent lamps does not distort the familiar coloring of objects and people. Businessmen find that shoppers even come from outside usual trading areas to shop under the comfortable light from the fluorescent luminaires.

IS THE SIZE OF THE LUMINAIRE A PROBLEM?

No. The Form 206 luminaire is only slightly over six feet long and the distinctive size and shape add functional beauty to the appearance of any street or roadway. No guys or trusses are required to support the luminaire even in high winds.

WHAT MAINTENANCE IS REQUIRED?

Maintenance is reduced! The fluorescent lamps used in the Form 206 have an average lamp life of 7500 hours, or about two years of street-lighting operation. The hinged plastic globe is shatterproof and is tightly sealed to prevent dirt or insects entering the unit. Sun, rain, heat, cold, or aging do not adversely affect the plastic globe or the light output.

HOW DO COSTS COMPARE?

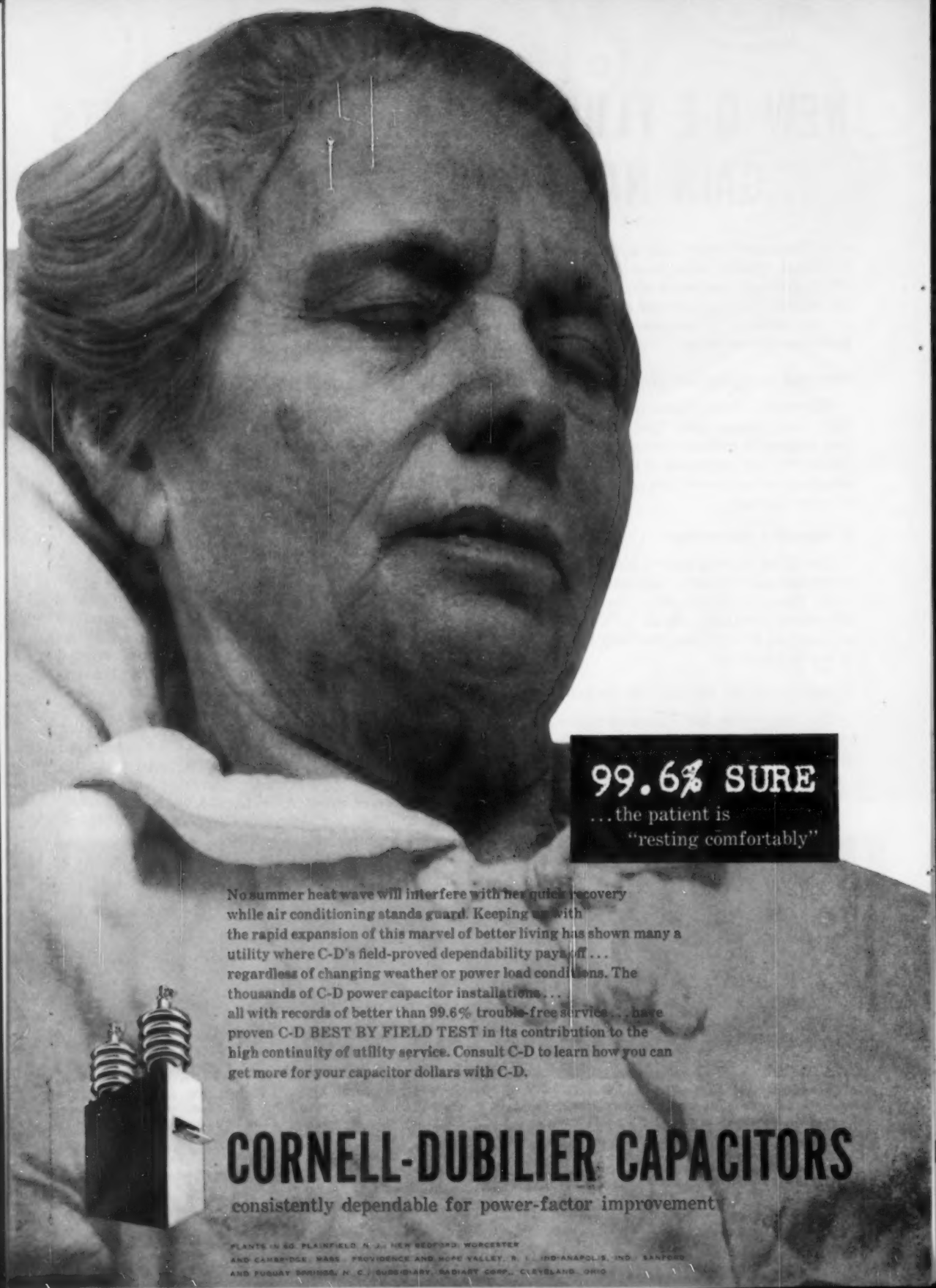
When over-all lighting costs are computed on an equivalent visibility basis, G-E Form 206 fluorescent luminaires cost less than any other comparable system of filament or color-improved mercury. Although equipment and amortization costs are somewhat higher, installation costs are comparable, and operating costs are generally lower.

GET MORE INFORMATION about this outstanding G-E fluorescent luminaire, the Form 206. Contact your nearest G-E Apparatus Sales Office, or write Section 452-139, General Electric Co., Outdoor Lighting Dept., 1400 Western Ave., West Lynn 3, Mass.

SOUTH—Statesville, North Carolina installed 104 Form 206 fluorescent street lights and was enthusiastic about their visual comfort, economy, and modern appearance.

WEST—Virtually glareless illumination and an even light pattern resulted when Seattle installed Form 206 luminaires to light the second level of this new Alaskan Way viaduct.

GENERAL ELECTRIC



No summer heat wave will interfere with her quick recovery while air conditioning stands guard. Keeping up with the rapid expansion of this marvel of better living has shown many a utility where C-D's field-proved dependability pays off . . . regardless of changing weather or power load conditions. The thousands of C-D power capacitor installations . . . all with records of better than 99.6% trouble-free service . . . have proven C-D BEST BY FIELD TEST in its contribution to the high continuity of utility service. Consult C-D to learn how you can get more for your capacitor dollars with C-D.

CORNELL-DUBILIER CAPACITORS

consistently dependable for power-factor improvement

PLANTS IN SO. PLAINFIELD, N. J., NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS., PROVIDENCE AND HOPE VALLEY, R. I., INDIANAPOLIS, IND., SANFORD AND FUQUAY SPRINGS, N. C.; SUBSIDIARY, RADIART CORP., CLEVELAND, OHIO

CORNELL-DUBILIER power-factor capacitors give you better than 99.6% trouble-free service*

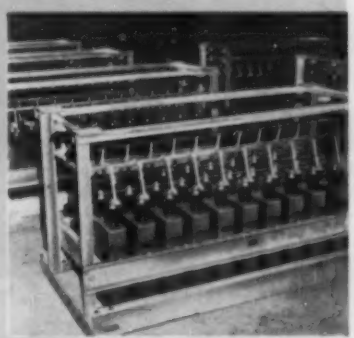
C-D capacitors are impregnated and filled, in hermetically sealed containers with non-inflammable, non-explosive Dykanol. In addition, C-D's conservative engineering and design makes possible the use of special impregnants to fulfill even the most exacting requirements of sub-zero switching operations.

C-D's rack capacitors are shipped completely assembled ready for energization. Again C-D's conservative engineering standards provides the structural strength to do this and as a result save the utility time, assembly and installation costs in the field.

Lowest volts per mil unit stress results in the extra margin of safety necessary to withstand all system high voltage transients. This lower volts per mil and lower volts per section feature is the utility's assurance of extra longevity when C-D's are specified.

Only C-D power capacitors are subjected to a full-rated voltage energization test. C-D removes potential trouble-makers before they get on your poles . . . not after with costly replacements.

Why is it that only C-D power capacitors give you assurance of complete dependability?... because C-D's built-in safety factor results from the ultimate in tried and proven design levels coupled with conservative production techniques and rigorous quality control. For catalog write to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.



C-D 550 KVAR; 2,400V; single-phase, open frame, stacking rack capacitor assemblies.

*This is an average based on reports from leading utilities using C-D capacitors. Many of these reports have shown 100% trouble-free service, and none lower than 98.9%.

INDUSTRIAL BRIEFS

Pumping water continuously from the Rock Slope coal mine at Primrose, Pa., with a 400-hp, 4,500 gpm electric machine has enabled the Peca Coal Co of Morea, Pa., to reopen the shaft and to resume plans of sinking another shaft a half mile west of this mine. The pump was installed next to the customer's own substation near a high-water underground basin which feeds water eastward from this point. The owner now can operate the mine, which had been developed through past years at considerable expense. Also, he can develop the nearby site where tests reveal thousands of tons of premium anthracite are still buried. Noble Clemens, Industrial Representative, Pennsylvania Power & Light Co, Pottsville, Pa.

Anodizing refrigerator parts, using seven germanium rectifiers to supply dc, has cut manufacturing costs at General Electric Co's Appliance Park, Louisville, Ky. Seven cubicles—costing only ¾ as much, and operating at efficiencies 12½ % higher than rotating power conversion machinery—supply up to 40,000 amp at voltages from 12 to 24. Because each cubicle consists of two independent rectifiers, parts of the power supply may be shut down without disrupting production. I. A. Lee, Sales Manager, Rectifier Equipment, General Electric Co, West Lynn, Mass.

Baking plastic-like coatings of Heresite on chiller condenser heads is being done at Acme Industries, Jackson, Mich., by a cooking unit that uses hermetically sealed glass lamps with internal gold reflectors. Heresite stops corrosion on the metal caused by circulating water. It is glass-like when baked, and desirably elastic. Lamps are rated 1,550-w, 230-v and heat metal and coating to 275F in 20 min. The entire oven has eight two-lamp units totaling 24 kw. Four units line both sides of a conveyor which carries the chiller condensers. Four condensers at a time are pushed into the oven and positioned so a pair of lamps heats the head end of each. Individually timed from 0 to 60 min, the heaters bond the phenolic coating well in 20 min. The former gas oven method required 2½ hr. M. L. Bruce, Power Sales Engineer, Consumers Power Co, Jackson, Mich.

Benzedrine for The "Sleeping Beauty"

Dishwasher to get new promotional push after housewives acclaim way it saves drudgery, boredom and time. Cincinnati is testing NEMA campaign

GIANT DISHWASHER AND FLYING SAUCER pulled thousands of prospects for Cincinnati G&E last year. Company is using similar tactics in present drive

The long-drowsy dishwasher market may finally be shaken from its slumber.

A new all-out promotional push is now rolling into action, and its sponsor, the Household Sink Units Section of National Electrical Manufacturers Association, has high hopes it can step up market saturation (now at a lowly 3.5%).

The promotion is getting its first test in Cincinnati this month where Cincinnati Gas & Electric Co has a four-week-long, city-wide campaign underway. Featured in the drive will be elaborate displays in the lobby of CG&E's main office, special consumer contests, and heavy advertising by utility and dealers.

Old hand at selling dishwashers, CG&E is out to beat records made in its "Flying Saucers" promotion of a year ago (see picture). It was with this campaign CG&E jumped dishwasher sales 30.3% over its previous year's record—nearly twice the national increase.

Capitalizing on the high public interest in flying saucers, the utility attracted thousands to its lobby-showroom where they viewed sworn testimonials of saucer sightings. While there, they were given a demonstration of still another kind of flying saucer—those being washed in an electric dishwasher. At the demonstration's conclusion each prospect was handed a plate imprinted with a dishwasher selling message. More than 20,000 plates were given away.

In its national campaign the NEMA section will rely on manufacturer's advertising backed by local activities of utilities, dealers and distributors. The section, itself, is rounding out the program with consumer and trade magazine publicity, selling aids for dealers and a monthly bulletin for the industry titled "Dishwasher Action."

"Ohio Study" Will Help

Probably the most powerful and authoritative sales tool the section has at hand, however, is the now-famous "Ohio Study." This carefully-controlled series of tests, made among 10 homemakers, compared dishwashing by hand to washing with an automatic electric dishwasher. It's aim: to find out, on a scientific basis, just how much better a dishwasher is.

This was the outcome:

- Average time for machine washing was about half that for handwashing—35½ min per day versus 73.2 min. This covered all phases of dishwashing—washing, rinsing and drying;
- Average bacteria count of electrically washed dishes was well below that of dishes washed by hand, and comparable to standards required for public places by the U. S. Public Health Service;
- Fewer tea towels were used in machine washing—an average of 24 during the 30-day period as compared to 42 for handwashing;
- Less breakage—only two items were broken of the total 34,345 separate items washed automatically, while 11 of 37,946 items washed by hand were broken.

(*Continued on page* 138)

PUBLIC LIBRARY, ST. JOSEPH, MISSOURI

Irregular shaped ceilings often posed difficult lighting problems ...until GrateLite was invented. This is a louver that can be fitted to any shape!

results:

A new concept of ceiling design that distributes the light evenly throughout the room without glare and annoying shadows—an inviting, eye-soothing illumination of high intensity at low brightness.

MARTIN DELICATESSEN, UNIONTOWN, PA.

Beauty treatment for odd-shaped ceilings...

GUTH GRATELITE*

LOUVER-DIFFUSERS

* TM Reg. U.S. & Can. Pats. Pend.

LUTZ DRUG STORE, SAGINAW, MICHIGAN

Guth

THE EDWIN F. GUTH COMPANY
ST. LOUIS 3, MO.

trusted NAME IN LIGHTING SINCE 1902

DODGE AGENCY GEN. OFFICE, SALINA, KAN.

May we send you detailed information and layout guide FREE?

why **E-M** anchor rods defy rust and corrosion

It's the extra heavy coating of zinc that does it . . . makes E-M anchor rods extra resistant to the forces of corrosion. At the ground line in particular, where corrosion conditions are worst, this heavier galvanizing pays off for you in longer service life. Other E-M features include carefully designed eyes to support the strand and develop its full strength, large size markings for easy length and diameter identification, and conformity to E.E.I. and other user specifications. Available in a complete range of diameters and lengths in single, double, and triple eyes.

IF YOU'D LIKE A SAMPLE, OUR COMPREHENSIVE NEW CATALOG, OR A CALL BY OUR REPRESENTATIVE, A NOTE WILL GET PROMPT ACTION.

EM

ELECTRICAL MANUFACTURING COMPANY • Battle Creek, Michigan

Designers and manufacturers of pole-line hardware that saves you time, money, and maintenance. Prompt action on special problems.

(*Continued from page* 136)

Conducted by Dr. Elaine Weaver and Clarice Bloom of Ohio State University, the tests were made over two 30-day periods. In the first period, handwashing of dishes was timed, observed and recorded. The same was done for machine washing in the second test. The 10 homemakers washed more than 5,000 pieces by hand or from 88 to 169 items a day; the dishwasher handled from 2,384 to 4,780 pieces, or 88 to 159 items a day.

Except on rare occasions, the dishwashers were used only twice a day—breakfast and luncheon dishes were washed together, dinner dishes separately.

What were the reactions of the homemakers who took part in the tests? They appreciated, more than anything else, the relief from boredom of dishwashing drudgery. The time saved, they found could be devoted to family and community. And almost every participant mentioned how much easier and freer she felt when entertaining because there was no immediate need, as they put it, "to get the dishes done." Another thing they liked: the neater kitchen look, and the fact that soiled dishes could be tucked away out of sight until a full load was ready for washing.

Utility Lends Workers Cash to Buy Appliances

West Penn Power Co is helping its employees to buy electric appliances and wiring by providing direct financial assistance.

A two-month-long appliance purchase plan was started June 1. It gives employees cash loans at a low interest rate. The employee is free to buy whatever brand of appliance he desires from any dealer he may choose. All transactions are entirely between him and the dealer. Loans are restricted to purchases of equipment to be used only in the employee's home, or can be applied to home wiring modernization jobs.

West Penn hopes the plan will accomplish several things: build employee relations; make better use of employees as boosters of electrical living; build new markets for the retailer and bigger loads for itself.

(*More S&S on page* 147)

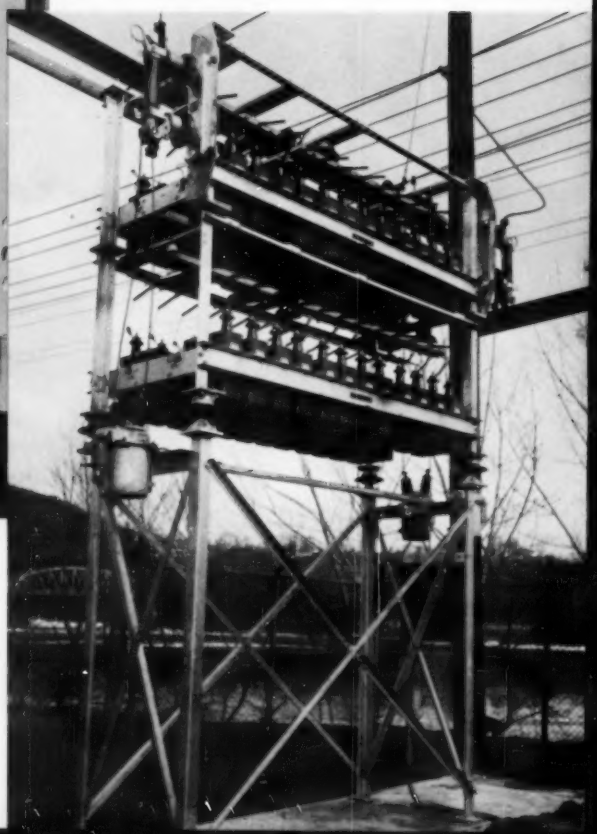
Product design ideas that help you reduce distribution investment

"I'm Hank Lokay. As an Electric Utility Distribution Engineer for Westinghouse, I want to report to you our concern, from an equipment standpoint, with the problem created by steadily rising load demands on your distribution systems: how to help you provide the required capacities with the least investment.

"On the next 7 pages, you will find some apparatus developments that promise substantial economies in strengthening or expanding distribution systems."

YOU CAN BE SURE... IF IT'S Westinghouse

"Here's Ralph Marbury, Manager of Capacitor Engineering, to spell out the economics of Westinghouse capacitor designs. He's holding a CJ-4 voltage control, a type used to control the typical substation installation of open, stack-type capacitors shown below."



Capacitor design eliminates special engineering, speeds installation

A proved and thoroughly effective means of keeping pace with growing distribution loads is the Westinghouse capacitor. There are two important reasons why. First, capacitors provide a net gain in work current load on existing lines with existing transformers throughout the system. In terms of equipment dollars invested, no alternative method is as economical.

Second, Westinghouse makes it possible for you to buy capacitors in easier-to-order, more convenient-to-use packages. Individual job engineering, time-consuming construction, and assembly on site have been designed out.

For example, for pole mounting on primary or secondary lines, Westinghouse furnishes capacitors in crossarm racks containing one to four units. Capacitors, singly or in banks, can be mounted or removed quickly and easily to meet load needs. Converting banks from fixed to switched is a simple matter with the addition of a CSO switch to the assembly without disturbing the capacitor units.

The Westinghouse Autotrol*, providing automatically switched capacitors at costs as low as $6.54 per kvar, is designed as a complete package. Installation requires only the connection of assemblies to control and power sources.

As a means of supplying kilovars direct to high-voltage circuits at substations, large, open-type capacitor banks are quite economical. Standardized stack units are easy to work with, and can be tiered into combinations for any voltage requirement, rearranged or built up to meet changed conditions.

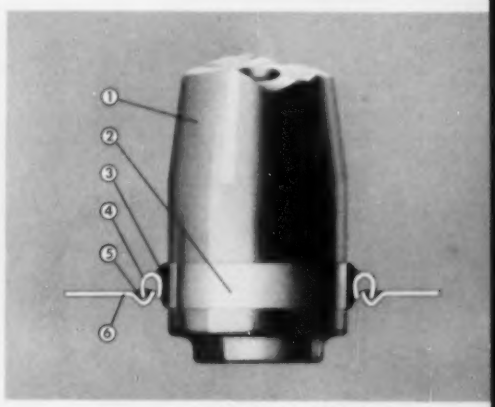
So whatever the immediate problem, capacitors may be added in any increment, and hence system capacity may be raised at any point or at any rate desired. Whether used to pinpoint trouble spots, or to boost over-all efficiency, Westinghouse capacitors provide you with an economical method of controlling kilovars according to load pattern.

Electrically and physically, Westinghouse capacitors have the flexibility to fit easily into your load improvement plans.

*Trade-mark

The zinc spray finish provides lifetime protection to Westinghouse capacitors. With the "A to Z" test, your Westinghouse sales engineer can demonstrate this to you conclusively.

Strength of the time-proved hermetic solder-seal between the porcelain bushings and the case is best demonstrated by force applied at right angles to bushing center line.



This section of capacitor bushing construction shows: (1) porcelain, (2) tinned platinum band on porcelain, (3) solder, (4) shock absorbing mounting ring, (5) solder, (6) capacitor cover.

YOU CAN BE SURE...IF IT'S

Westinghouse

"John Chiles, Engineering Manager, Transformer Division, explains how you save through transformer height and weight reductions. Below, he shows you the marked difference in size of the old and new 100-kva unit."

Shorter, lighter transformer design helps reduce cost of change-outs

Change-outs to higher rated transformers can be expensive — particularly if the size and weight of the transformers you install require heavier poles.

With the new Westinghouse pole-type distribution transformers, however, you can, in many instances, save the cost of larger poles—and a lot more!

Up to 26% lighter – 17% shorter

A new core-coil assembly — the most compact ever designed — has permitted weight and height reductions throughout the entire line. In the higher rated units, in particular, these reductions are substantial (see below). The 167-kva transformer, for example, is 26% lighter and 17% shorter than the old design.

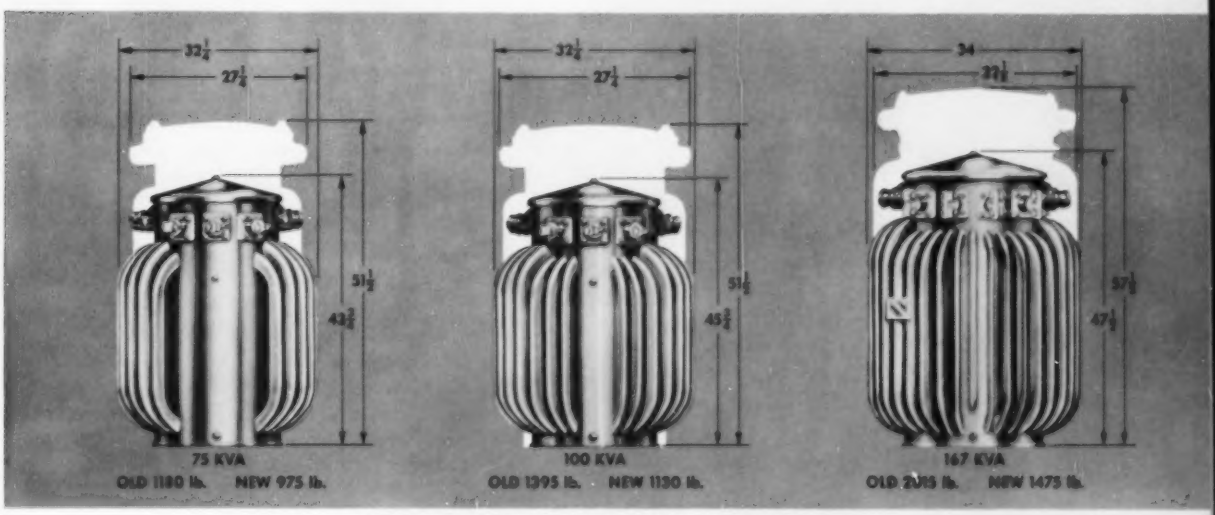
Now, a 75-kva transformer requires the same size pole as the old 50-kva unit — the 100-kva model the same as the old 75-kva unit. The 167-kva transformer no longer requires a platform — it can be direct-pole mounted. And don't forget, these lighter, smaller transformers are easier to handle and require less storage space.

New features reduce installation time

Simplified installation means still more economy. The single captive bolt on the new dome cover saves time in tap changing. Insulated knobs on the bushings make for faster, safer connections.

For maximum economy in installation, we nominate the new Westinghouse CSP®. Integrally mounted arresters save you both engineering time (to determine ratings) and installation time of separately mounted arresters.

But economy is only part of the story of these all-new pole-type transformers. There's also a new high in performance and a new low in maintenance. So call your Westinghouse sales engineer today for complete details, or write for the Trans-Vision booklet, B-6403.



Height and weight reductions in higher rated transformers.

YOU CAN BE SURE...IF IT'S
Westinghouse

"Here's a sure way to reduce distribution investment: make one device do two jobs. Below, Fred Reiber, Sales Manager, Switchgear Distribution Apparatus, describes the new load-break feature of the DX cutout. Opposite, Chester Upton, Switchgear Devices Engineer, tells about the load current interrupting feature of the VLB switch."

New load-break DX cutout designed as manual disconnect

The familiar, dependable Westinghouse DX open-fuse cutout has become a new tool to help you save on investment and operating cost of distribution equipment. A simple, built-in load-break device now permits linemen to break the fuse link mechanically with a hookstick.

With the new load-break DX cutout you can disconnect loaded capacitor banks, transformers or other such apparatus conveniently, without opening main switches or breakers farther back on the line. When the hookstick breaks the link, the fuse tube drops down in the usual manner. The top contact pressure is actually increased until the break occurs, so that no arc is drawn at this contact, but is confined to the fuse tube.

This new Westinghouse development is a real convenience and certainly a time saver. But above all, it provides the added function of a manual disconnect without the addition of separate switches ahead of the cutout. The load-break mechanism is optional at a slight additional cost . . . think what it can mean in terms of equipment that you do not have to buy!

VLB interrupter being filled with sulphur hexafluoride.

VLB switch . . . first low-cost design to interrupt HV load current safely

By the simple expedient of designing a new interrupter into the standard type V air break switch, Westinghouse can now equip you with an inexpensive, cost-cutting product. First, the VLB switch interrupts load currents up to 600 amps on high-voltage lines, which previously had to be serviced by more expensive equipment. Second, the VLB performs load interrupting duty with complete safety. Arcs are fully enclosed.

The VLB interrupter uses sulphur hexafluoride, a gas of outstanding deionizing ability, 100 times better than air. Ordinary air break switches have proved hazardous and costly in a service for which they are not designed. Since it is no larger than the usual air break switch, the VLB can readily replace it anywhere.

This switch also interrupts line charging current for 100 miles of line, and magnetizing currents for transformer banks up to 100,000 kva. Basic performance of this Westinghouse switch is proved, and newly developed applications are solving still other old problems. While utility engineers are convinced that its potential range of uses has not been fully explored, we know for certain that the VLB will help you improve your distribution system quickly, safely, and inexpensively.

YOU CAN BE SURE...IF IT'S

Westinghouse

"John Harrell, Manager, Regulator and Network Transformer Sales, points out how simplified design of new URL-16 pole-type regulators saves money in installation, operation, maintenance."

New URL-16 regulator designed for simplicity, economy

This new Westinghouse URL-16 will meet your every requirement for simplicity — and, thus, economy — in pole-type voltage regulators.

Complete mounting flexibility is designed into these new regulators to save you installation expense. The unit can be mounted directly on the pole, on a crossarm, or bolted to a platform. Remote installation of the control is simplified. Extension cord flexibility is provided by a weatherproof plug-in receptacle on a flexible, neoprene cable connecting the control to the regulator. Cabinet can be easily detached from the tank without opening the door. Integral arresters eliminate the time and expense required to plan and install separate arresters.

You save in operation and maintenance, too. Single bolt cover speeds internal inspections. New position indicator is easy to read, can be reset from the ground with a hookstick. Separate compartments are provided for the tap changer and the core and coil assembly, ending contamination of the core-coil oil and reducing the replacement of tap changer oil to 2½ gallons. And, exclusive "Coastal Finish" doubles resistance to corrosion under all operating conditions.

The sum of all these moneysaving features is the new URL-16 — the simplest and best answer to your problems of accurate voltage regulation on your distribution lines.

THE MAN WITH THE FACTS

For complete information about the apparatus shown above and on the preceding 6 pages, call The Man With The Facts — your Westinghouse sales engineer. Or write to Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE...IF IT'S Westinghouse

CP-1032

600 Room Coolers

. . . equipped with heating coil, they heat and cool a 25-story Pittsburgh office building

A major Pittsburgh office building has installed and tested a new heating and air conditioning system—using room air conditioner units—that is claimed to meet modernization problems far better than complementing an existing steam heating system with a central air conditioning system.

A report on the new combination system, the largest installation of its kind, was made by R. J. J. Tennant, chief engineer of the Henry W. Oliver Building, and Jack Cherry, air conditioning sales manager of Philco Corp.

The new system uses a steam heating coil mounted in ¾ and 1 hp room air conditioners. More than 600 of the units will have been installed in the building by late this summer.

Lower Costs . . . Tennant declared that costs of the new system were approximately 50% less than the lowest preliminary bid on various types of central air conditioning systems for the 25-story building.

A copper heating coil, with a radiation surface, equivalent in heat output to the largest cast iron radiator used in any room, was located in the plenum chamber of the room air conditioner. The air conditioner fan is operated by a two-speed motor, full speed for air conditioning and half-speed for heating.

A bi-metallic thermostat connected in series with the fan circuit controls the fan operation. The fan comes on at half-speed when the temperature in the plenum chamber reaches 110 F and shuts off when the temperature drops to 95 F.

"A great improvement in heating of offices was a major reason for many tenants accepting the new system," the building engineer said. "They considered the air conditioning as a special bonus."

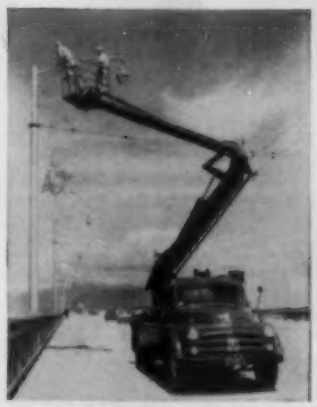
Increase in heating efficiency is shown by the use of only one air conditioner with a heating coil in corner offices where formerly two cast iron radiators were needed.

A major tenant relations problem,

before you buy an aerial platform...

check these outstanding advantages of GIRAFFE

MORE SAFETY — With outriggers, Giraffe lifts 1000 lbs., any radius, any boom position.* This extra capacity, plus thorough insulation of platform, means extra safety for workmen aloft.



MORE EFFICIENCY — Giraffe's crane-like, turntable design enables it to lift 450 lbs., with no outriggers, making possible tremendous time and labor saving on any job where truck must be moved frequently.

MORE STABILITY — Because it is built to take extra heavy loads, Giraffe's stressed, high-tensile steel boom provides amazing stability. Bobbing and weaving are no problem to men on Giraffe's platform.

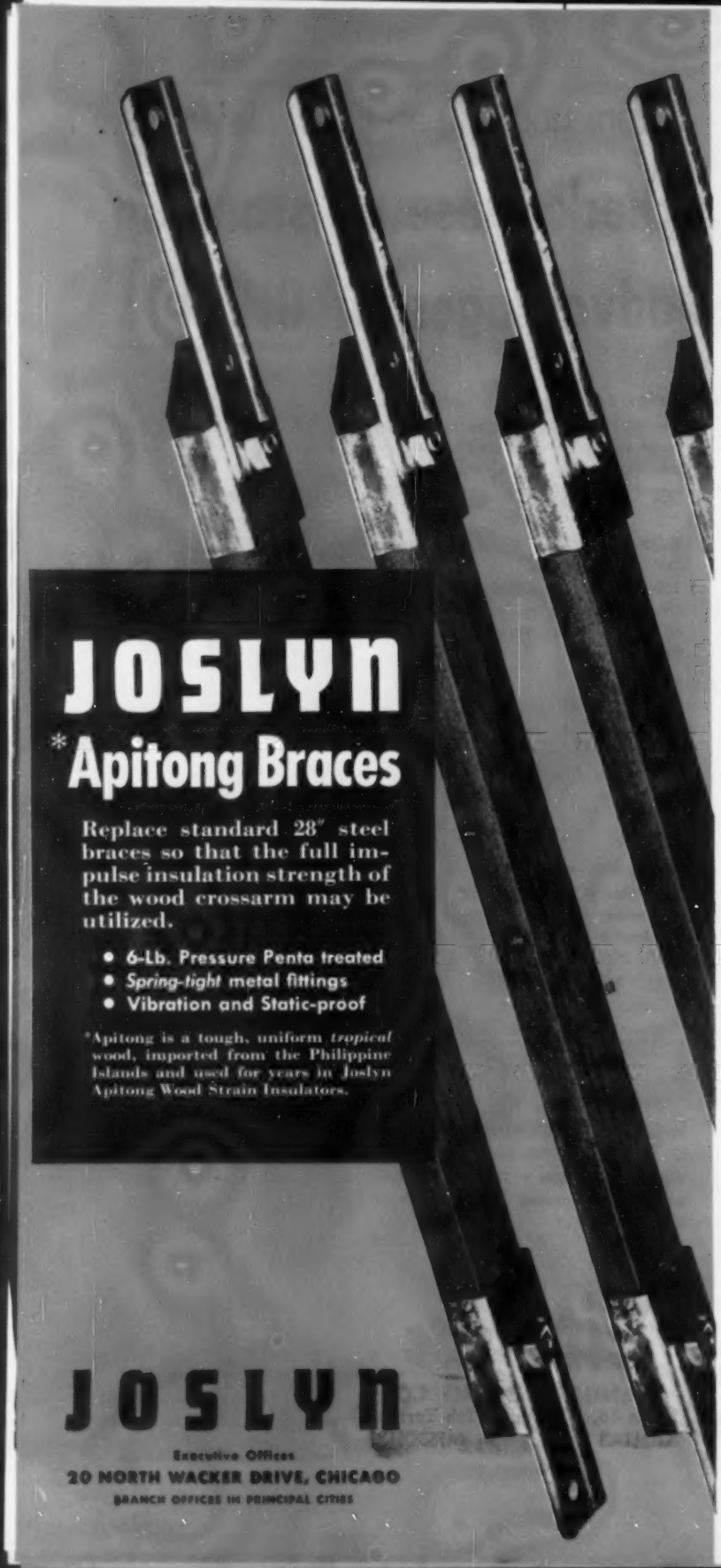
MORE USEFULNESS — Cross arms, transformers, heavy tools . . . Giraffe not only takes men up to heights of 40 feet, but these items and many others as well. Again, it's Giraffe's extra capacity that gives it extra usefulness.

*With foot controls on platform, or hand controls at ground, operator can rotate boom 360°, continuously, in either direction. Also, upper and lower boom sections can be operated independently or both at same time.

WRITE FOR BROCHURE — See why Giraffe is today's best buy . . . by far in aerial equipment. Your request will bring fully-illustrated, 8-page brochure by return mail.

Pitman

MANUFACTURING CO.
Room 15, 300 West 79th Terrace
KANSAS CITY, MISSOURI


JOSLYN
*Apitong Braces
Replace standard 28" steel braces so that the full impulse insulation strength of the wood crossarm may be utilized.
• 6-Lb. Pressure Penta treated
• Spring-tight metal fittings
• Vibration and Static-proof
*Apitong is a tough, uniform tropical wood, imported from the Philippine Islands and used for years in Joslyn Apitong Wood Strain Insulators.
JOSLYN
Executive Offices
20 NORTH WACKER DRIVE, CHICAGO
BRANCH OFFICES IN PRINCIPAL CITIES

too, was solved by the individual room air conditioners, it was pointed out. Management of the building, when considering air conditioning, was reluctant to ask tenants to take the new air conditioning if they did not want it. It was concerned, too, with the tremendous amount of work involved in building a central system, and the noise and inconvenience to tenants.

S&S SHORTS

In The Army Now

El Paso Electric Co hopes to boost freezer, refrigerator and air conditioner sales with a 90-day "Operation North Pole" campaign which continues through Aug. 31. Dealer salesmen received clever induction orders notifying them to report for service in an all-out war against improper food preservation and summer heat. As sales are made, salesmen are advanced in army rank and given stamps redeemable for merchandise. A man who sells 13 freezers and air conditioners is made general of the army and awarded $25 in cash.

Lighting May Have Saved 200

Improved street lighting may have saved as many as 200 lives in Los Angeles traffic in the past year, H. W. Sullivan of Los Angeles Police Department recently told Southern California Section, Illuminating Engineering Society.

New Lighting Items:

• A unit for garden and landscape lighting, using a mercury-vapor lamp as its light source, has been introduced by Lightolier, Inc. Unit is said to be the first standard-unit adaptation of mercury-vapor landscape illumination.

• A fluorescent fixture designed especially for illuminating blackboards is offered by Sylvania Electric Products, Inc.

• New ideas for tapping a wide new market—outdoor lighting around the home—are contained in General Electric Co's new 28-page booklet, "Outdoor Lighting for Family Living." Booklet lists five benefits of outdoor illumination: it increases hours of play, adds time for yard work, safeguards against accidents, expands hospitality and comfort of terraces, reveals beauty of gardens after dark.

Educate to Sell Lighting

(*Continued from page* 102)

not be duplicated, 4,000 children could be serviced for 10½ ¢ each.

How do you get started with your program? The procedure is like this: Start as high up in the state department of education as is possible in your state set up. Some have started by contacting the state superintendent of schools. Some began with the county supervisor, and some have worked directly with the local superintendent, where the state education setup is decentralized.

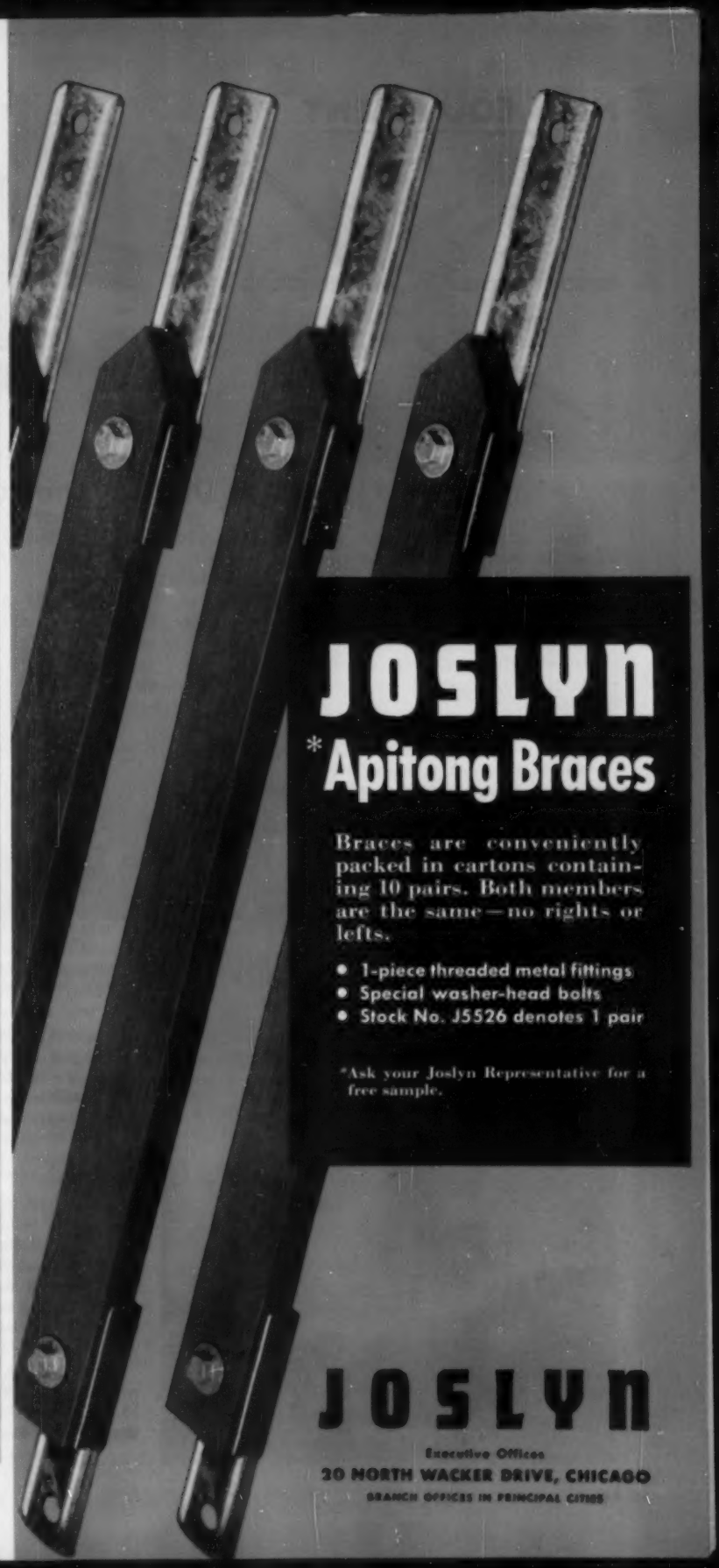
When approval is secured, the next step is to arrange local meetings with teachers. There you explain the materials, sell the teachers on their use, and find out what their requirements will be. It is a good idea to follow up later on in the year to see if the materials were used, whether they were found satisfactory, and what the needs will be for the next year.

Other Aids

The utility may, if it wishes, back up the program with motion pictures, such as the bureau film, "Light Is What You Make It," produced by Walt Disney, or films produced by lamp manufacturers. Other methods: Distribution of BLBS and manufacturers' pamphlets; annual programs tied in with the optometrists' Sight Saving Week; bonus bulb activities.

The education program should also be supplemented by distribution of the bureau magazine, "Better Light Better Sight News." This bi-monthly publication (circulation over 12,000) is subsidized and distributed by electric utilities who mail it to school teachers, school administrators, PTA and school board officials, optometrists, doctors, school nurses, and others.

Better Light Better Sight Bureau, now in its 21st year, is jointly sponsored by Edison Electric Institute and three leading lamp bulb manufacturers. Its activities are directed by committees drawn from personnel in the utility and lamp manufacturing industries. An executive committee directs activities and formulates policies. There also are two working committees: A home lighting education committee under Chairman Walter G. McKie of Rochester Gas & Electric Corp, and a commercial and industrial lighting education committee under H. B. Gould of Ohio Edison Co.


JOSLYN
*Apitong Braces
Braces are conveniently packed in cartons containing 10 pairs. Both members are the same—no rights or lefts.
• 1-piece threaded metal fittings
• Special washer-head bolts
• Stock No. J5526 denotes 1 pair
*Ask your Joslyn Representative for a free sample.
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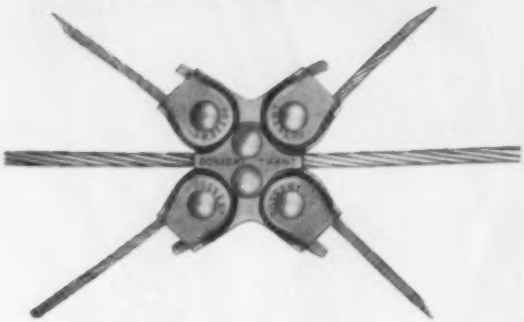
BRANCH OFFICES IN PRINCIPAL CITIES

NEW EQUIPMENT



Service Drop Connectors

Triplex cable connectors are designed for overhead distribution systems where triplex or quadruplex cable is used on both the secondary and service drops.

The connectors are a combination set—a neutral connector has a complement of two insulated type connectors. Each has circular slots for conductors.

Neutral connector (left) has a cast aluminum body with a bolted main cap and four bolted service clamping caps. It may be attached or suspended at any point on the neutral, and clamped by wrench.

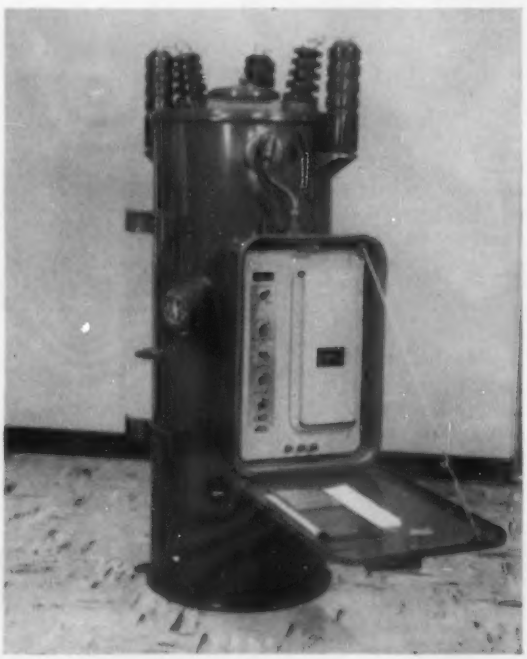
The insulated type connector is an aluminum alloy with stainless steel hardware. It is housed in a high-strength Bakelite cover which is secured by two aluminum alloy screws. A spring pressure washer is used under the main clamping nut. Keeper in the service clamp is secured by headless socket screws.

When used with copper conductors, the connector body is made of a copper alloy. For a combination of aluminum to copper, it is made of copper alloy which is hot-tin dipped to prevent galvanic action.

Connectors are made in two styles which accommodate two and four service drops each. They are available for secondary conductor sizes ranging from No. 2 to 4/0, for service drop sizes ranging from No. 6 to 1/0.

Dossert Mfg Corp, 249 Huron St, Brooklyn 22, N. Y.

Pole-Type Step Regulators



Redesigned line of pole-type step regulators is claimed to have improved electrical characteristics, improved sealing and fewer parts.

Regulator cover is secured with a single bolt through its center and threaded into an internal beam support. The bolt applies uniform pressure throughout the circumference of the Corprene cover gasket.

Plug and receptacle units on tank and control cabinet replace a junction box. Flexible cable can be used when control cabinet is located at base of pole.

An integrating voltage regulating relay (Type CJ-1) is mounted on a single draw-out chassis along with the voltage sensing device which includes time delay and auxiliary relays. Time delay can be varied from 5 to 40 sec. A voltage adjusting rheostat permits using the regulator as a voltage source in checking adjustment of the voltage regulating relay. Tap-changer motor can be disconnected so that motor will not operate while adjustment is being made in the regulating relay circuit. A weather-tight, glass-enclosed position indicator shows maximum and minimum range of regulation over any set period or time. It can be reset from the ground.

Regulators are available in standard ratings up to 200 amp at 2.5 kv, 150 amp at 5 and 7.62 kv, 100 amp at 13.8 kv, and 50 amp at 14.4/24.9 kv.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

(*More New Equipment on page* 154)

Accidents reduced...costs cut...with HAPCO Aluminum Standards

When Hapco Standards are installed, there's real reason for civic pride. Not only do they last longer, they look better longer because their silver gray surface is resistant to virtually all atmospheric conditions. Furthermore they require no maintenance so that the investment in Hapco Aluminum Standards guarantees minimum overall lighting cost. For proof that "Aluminum costs less," write the Hapco Engineering Department.

What's more, their high visibility helps reduce accidents.

Hapco Aluminum Poles are sturdy enough for the heaviest duty, yet they maintain harmonious beauty with their surroundings. All Hapco Standards are Venetian column type, acclaimed by architects for eye appeal and strength. For street lighting, for traffic control lighting, for area flood lighting, these Hapco Aluminum Alloy Standards allow you the widest possible choice in fine lighting equipment.

Be sure to call your Hubbard representative for assistance in specifying lighting standards, traffic signal pedestals, flood lighting standards, and related equipment. You can order Hapco products through more than 200 leading electrical distributors throughout the United States.

FREE HAPCO Catalog

If you'd like more details on design features and specifications of the complete Hapco line, write for this new free catalog. It contains valuable information to help you plan the most efficient, most beautiful highway and street lighting, as well as any other outdoor lighting requirement. (Hubbard Aluminum Products Company, 6301 Butler Street, Pittsburgh 1, Pa.)

HUBBARD ALUMINUM PRODUCTS COMPANY
Division of Hubbard & Company
Pittsburgh 1, Pa.

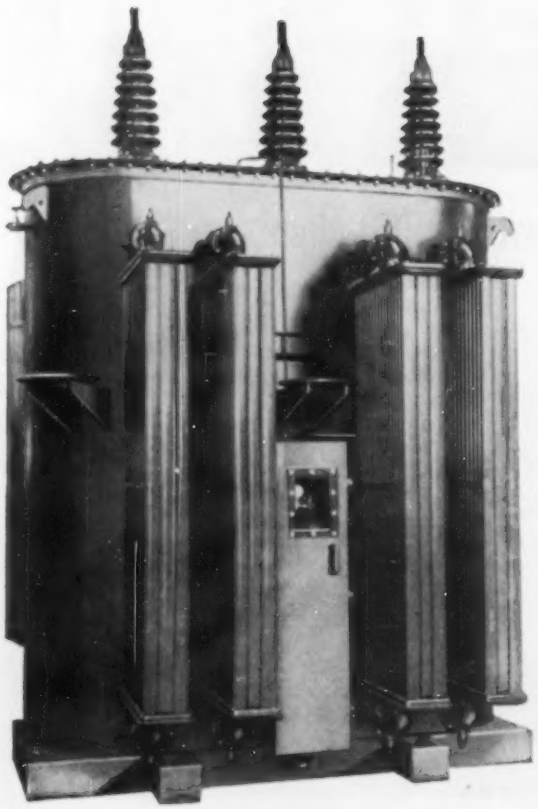
Power...
at their fingertips...

Industries, commercial establishments, whole families all depend on reliable electric power as a motivating force for good production, effective lighting and essential home comforts.

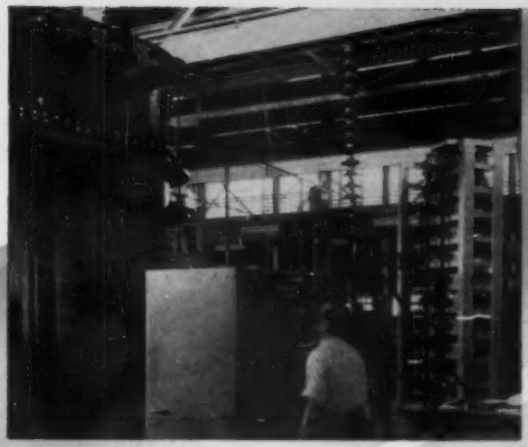
For 36 years Standard Transformer engineers, working with utility company engineers, have designed and manufactured better transformers for more efficient use and dependable channeling of electric power. Service records, dating years back, prove the dependability; the economy; the low maintenance cost of STANDARD Power Transformers.

STANDARD Power Transformers are embodied with compactness of design, inherent strength and exceptional stability. Manufactured with extreme care, STANDARD Power Transformers are built to your specifications. STANDARD engineers, working with your engineers, arrive at the best construction and design for your particular needs. Normal loads . . . and overloads can be handled again and again whenever emergencies arise.

There's a Standard Transformer representative near you. Call him. Have him help you with your power transformer installation.

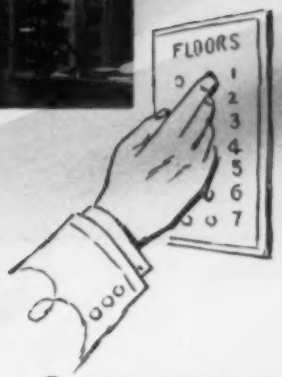


STANDARD Type AT, OISC Power Transformer, 7500 KVA, three-phase, 60-cycle, 66,000 to 13,800 volts, gas-seal construction, equipped with lightning arrester mountings and arranged for addition of forced air cooling.

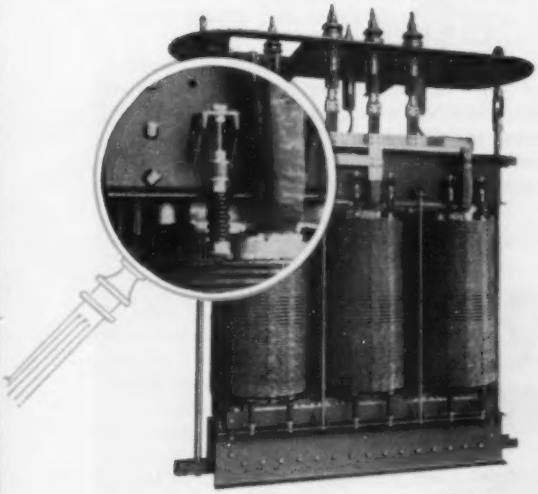


TESTING

This man is impulse testing a large Power Transformer in STANDARD'S modern plant at Warren, Ohio. A surge generator, with a range of one million volts, is used for ASA and NEMA standard and front-of-wave-impulse tests. Each transformer, no matter what the size, is subjected to standard commercial tests—both during manufacture and at completion. Experienced, thorough testing and inspection assure you of the finest transformer performance.

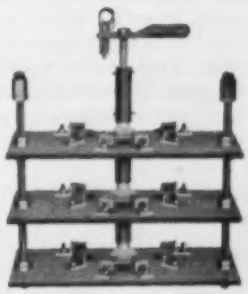


PUT THERE BY *Standard* TRADE MARK POWER TRANSFORMERS



TAP CHANGER

STANDARD'S specially designed three-deck tap changer switch is externally operated without excitation. It also has positive contact with wiping action which has proven dependable for many years. Normal settings are with a 4-tap voltage selection . . 2½% taps within 10% range of normal rating. STANDARD supplies transformers with 4 taps above or below, or half above and half below as specified by the customer at no extra cost. Contact-making points are submerged in oil.



CORE AND COIL ASSEMBLY

This view shows the low voltage side of the core and coil assembly of a Power Transformer. Note STANDARD'S special design spring bracing with compression-type porcelain insulators on high voltage coils to compensate for the movement of coils during short circuit. It also compensates for shrinkage of the coil in operation.

Standard

THE STANDARD TRANSFORMER COMPANY

Trade Mark (R)

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

Brush Cutter

Brush cutter attachment converts gasoline-engine driven chain saw into an all-purpose unit for clearing large areas overgrown with brush, weeds and small saplings.

The cutter has a flexible shaft which delivers 3.5 bhp to a 10-in. circular blade. A 5-ft arm makes it easy to reach low to get under overhanging branches or to reach high for overhead cutting and limbing. A diaphragm type carburetor permits cutting in any position, according to the manufacturer.

Homelite Corp, Port Chester, N. Y.

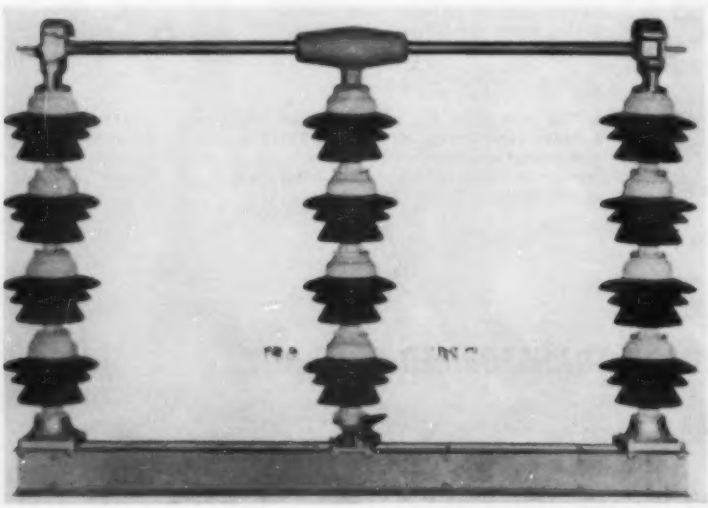
Service Cable Dead End

Wedge-type service cable dead end may be installed over a continuous run of triplex or quadruplex cable. The wedge can be released with a screw driver to readjust sagging tension. Since the wedge is symmetrical, either edge can be installed against the neutral thus facilitating installation and eliminating unnecessary twisting of the bail.

Both wedge and shell are made of aluminum alloy for "like metal" contact with the neutral. The phosphor bronze bail conforms to any shape hook, insulator or eye and minimizes line stresses on insulator and bail. The tinned bail is said to reduce the danger of galvanic corrosion between the bail and a secondary aluminum neutral when both are installed on a spool. A plated grommet on the bail eliminates sharp bends. It also eliminates the bail bearing directly on itself when looped.

One wedge-type dead end handles a range of aluminum conductors from No. 6 solid through No. 2 ACSR. Clamps are distributed by Line Material Co, Milwaukee 1, Wis.

Fargo Mfg Co, Poughkeepsie, N. Y.



Side Break Switch

Double side break disconnect switch is offered in ratings of 34.5 kv and above, in continuous current ratings of 600, 1,200 and 2,000 amp.

The Type RDC switch features high pressure AMPLITACT contacts, a minimum number of current interchange points, shuntless design and wide angle blade rotation.

All mechanisms are shielded for complete protection against icing and corrosive contaminants. In addition, the RDC is said to be designed with smooth corona-resistant contours resulting in low radio influence voltages.

Southern States Equipment Corp, Hampton, Ga.

(*More New Equipment on page* 158)

Use Simplex Control Cables

WITH PRINTED COLOR CODING

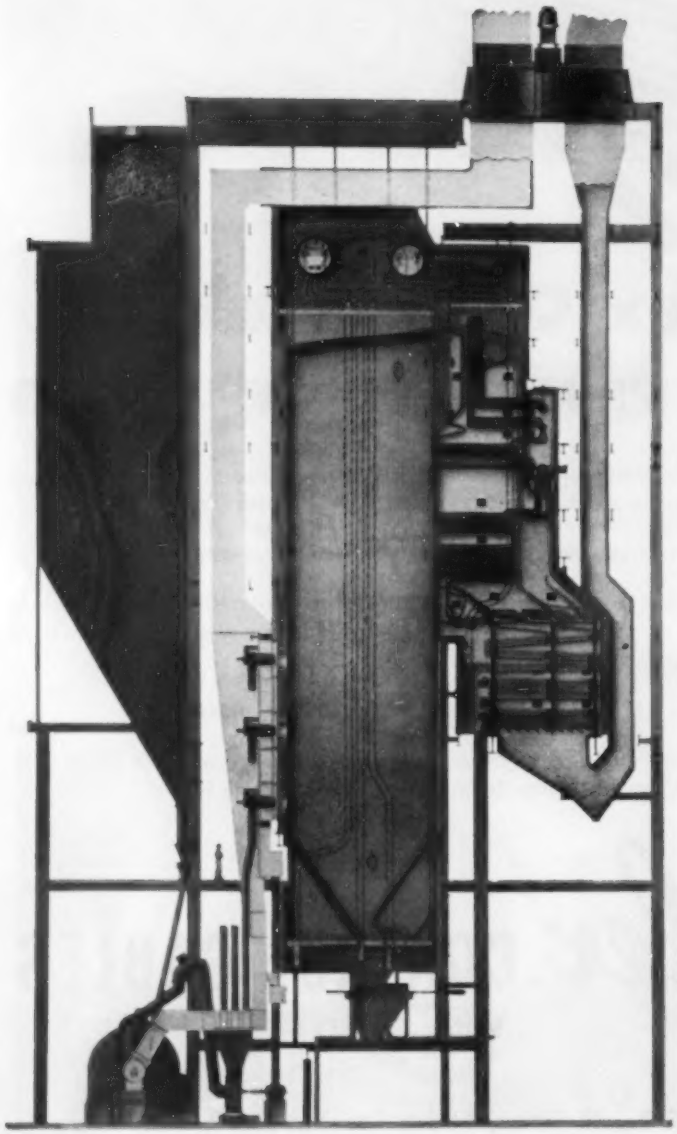
- Clear, white identification on a solid black background stands out every 2½ inches on two sides of each conductor in Simplex Control Cables.
- At a glance, printed color coding tells you what you want to know.
- When examining control cable conductors with colored rubber coverings in poor light, or after handling has discolored them, you know how hard it is to pick out the conductors with which you want to work.
- Printed color coding provides instant, definite identification.
- Find out more about printed color coding and the complete line of dependable Simplex Control Cables by writing to the address below.

Simplex CONTROL CABLES
with **PRINTED** COLOR CODING

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Massachusetts

Now "on the line"— another

"FIRST" and "LARGEST"



World's first dual-circulation REHEAT unit and New York City's largest steam generator —designed and built by Foster Wheeler— serves new 180,000-kw generator at East River Station

Cross section of Foster Wheeler Dual Circulation Reheat Unit for the East River Station of the Consolidated Edison Company of New York, Inc.

To keep *ahead* of rapid load growth in the world's largest city, Consolidated Edison Company of New York has constantly anticipated the electric and steam needs of its customers.

Latest step in a long-range expansion program is the completion of Unit 7 at the East River Station. This new 180,000-kw generator is served by a Foster Wheeler 1,450,000 lb/hr dual-circulation reheat steam generator operating at 1850 psig, 1000 F/1000F and arranged for pulverized coal firing. It is the first combination unit of this type ever built and the largest steam generator in New York City.

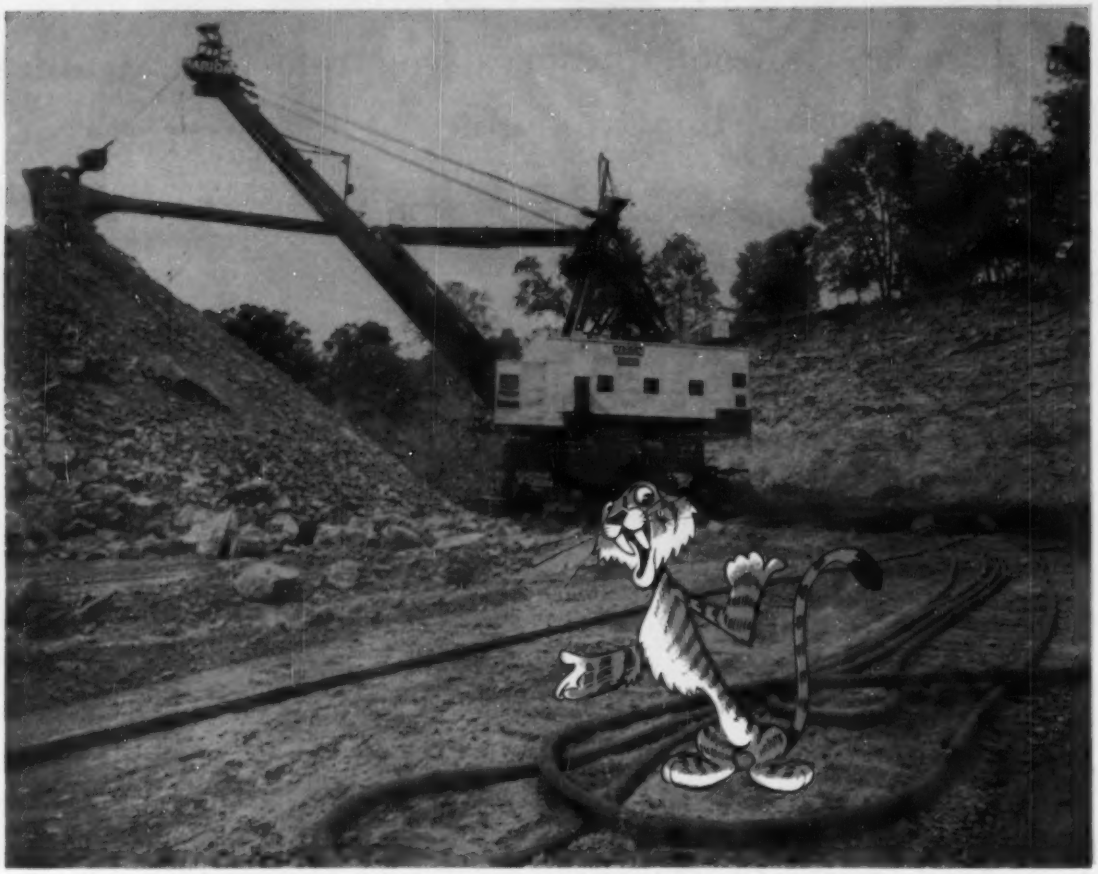
Through the application of the Foster Wheeler dual-circulation principle it is expected that steam of extremely high purity will be produced, particularly with respect to vaporized silica. The radiant superheater, in combination with a convection superheater, enables full primary steam temperature to be attained at from 35% to 100% of rated load. The reheater, located in the low-temperature zone after the convection superheater, provides protection against all variables in operation. This combined dual-circulation reheat unit is conservatively rated, with low heat-absorption rates per unit area and low furnace exit gas temperatures. FW turbulent burners and FW ball mills further contribute to high fuel economy per pound of steam generated.

For further details on Foster Wheeler dual-circulation steam generators, send for your copy of Bulletin B-50-11.

FOSTER FW WHEELER

Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.

They needed a top quality cable



THE 18-CUBIC-YARD SHOVEL moves a lot of overburden in a hurry. It is supplied with 7500 feet of 3-conductor 1/0 Tiger Brand Amerclad.

HERE IS THE MINE HEADQUARTERS. Wash tower is at center. Notice conveyor system at right that goes to power station over the hill.

like *Tiger Brand* for this high production strip mine

HERE IS A PORTRAIT of the 45-cubic-yard shovel that has removed most of the overburden at this mine.

IF you take a ride out near Zanesville, Ohio, someday, you'll spot the new Muskingum Mine—probably the most modern strip mine in the world. It supplies coal for the new 400,000 kw Muskingum River Plant of The Ohio Power Company, part of the American Gas and Electric System.

The big 18 and 45-cubic-yard electric power shovels operate day and night through sun, rain or snow. And when you consider the eye-popping cost of lost production time, it's easy to see why these shovels need the most dependable power cable on the market. At this mine, it's 100% Tiger Brand Amerclad.

The cable is always exposed to foul weather and accidental abuse. It often stretches for more than a *mile* from switchgear to shovel take-up reel. Yet, after more than 2 years on the job, the Tiger Brand Amerclad is in perfect condition without sign of wear.

If you need a cable that can *take it* . . . if you want cable for a power shovel, dredge, mine locomotive, welding machine or a heavy-duty electrical hand tool—you'll get more for your money if you specify Tiger Brand Amerclad. Drag it through puddles, over sharp rock; spill gasoline or oil on it and expose it to sun and ozone. Tiger Brand will still give you service you never thought possible. *Send the coupon.*

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB!

paper & varnished cambric cable
asbestos wire and cable
aerial, underground & submarine cable
shovel & dredge cable
mold cured portable cord
machine tool & building wire
special purpose wire & cable

—SEND THE COUPON—

American Steel & Wire Division
Room EE-75, Rockefeller Building
Cleveland 13, Ohio

☐ Please give me more information about Amerclad.
☐ I'd like to talk to your representative.

Name .....
Firm .....
Address .....
City ..... State .....

USS Tiger Brand ELECTRICAL WIRE & CABLE

USS

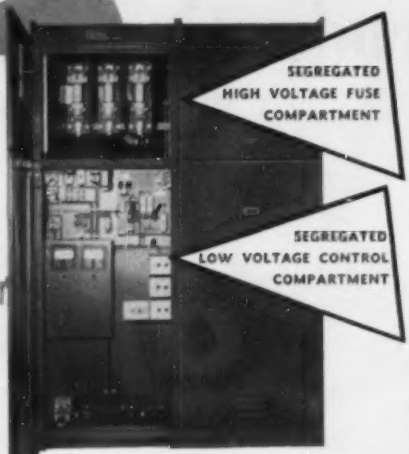
UNITED STATES STEEL

SAFEGUARD MEN AND MOTORS

with NELSON HIGH VOLTAGE, FUSED MOTOR STARTERS

- √ Safety interlock prevents access to fuse compartment until motor is taken off line.
- √ The current-limiting power fuses prevent costly repairs associated with short circuits.
- √ Steel barriers completely segregate high and low voltage compartments.

Nelson High Voltage Motor Starters with current limiting fuses are used for controlling 2300 to 5000 volt motors. Furnished with air-break or oil-immersed contactors. Indoor or weather-proof construction.



Weatherproof assembly for controlling two 125 h.p. synchronous motors on compressor drives in chemical plant.

• Write for details . . . . . NELSON Electric MANUFACTURING CO. TULSA, OKLAHOMA

PRESSITE
an unsized fibreboard having excellent dielectric, physical and chemical properties. Is used principally in air, oil and askarel transformers.

ELECTRITE
a high grade board for electrical insulation, possessing high tensile and dielectric strength. Used in a large variety of punchings and other insulating applications.

DENSITE
an extremely hard and tough board of superior quality. Used by many leading manufacturers of electrical equipment to replace the more expensive types of insulating materials.

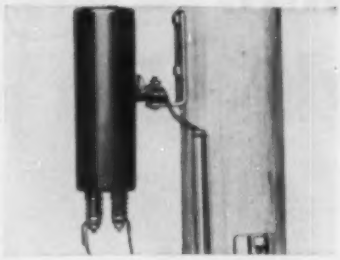
West Virginia Fibre Board
FOR ELECTRICAL INSULATION

PULP PRODUCTS DEPARTMENT

WEST VIRGINIA PULP and PAPER COMPANY
230 Park Avenue, New York 17, N. Y. 35 E. Wacker Drive, Chicago 1, Ill.

New Equipment

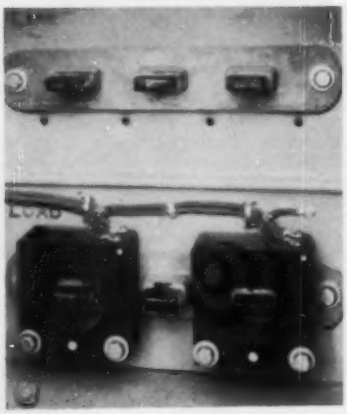
(*Continued from page* 158)



up or down. They are furnished with either a two-pole mounting bracket or a standard EEI-NEMA crossarm mounting bracket.

Steel tanks are protected from corrosion by an aluminum metallized finish that is covered by a primer and a finish coat of blue-gray alkyd-resin paint. Overall height of capacitors is 13¾ in. for the 3 kvar unit and 18⅝ in. for the 5 kvar unit. Both have a 5-in. diam.

Line Material Co, Milwaukee 1, Wis.



Breaker CTs

Metering and instrumentation current transformers mounted in breaker compartments are now available on the manufacturer's 225 and 6,000 amp drawout equipments. This feature has previously been offered only on 1,600 amp and larger breaker units. The new design is said to provide greater ease of maintenance since CTs can be removed, added or changed to another rating in a few minutes by removing two bolts and secondary wiring.

A three-phase molded disconnecting device which requires far less

(*Continued on page* 166)

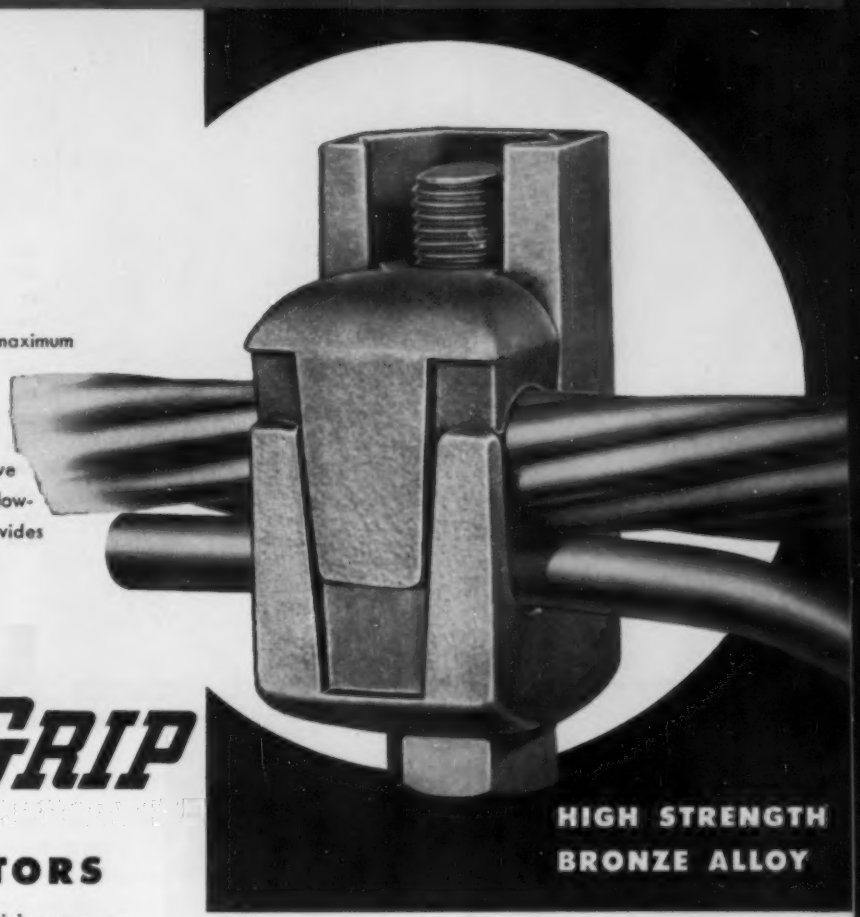
Anderson's SUCCESSOR to the SPLIT BOLT

EXTRA Strength . . .
high strength bronze alloy bodies
and high-tensile silicon bronze bolts.

EXTRA Savings . . .
re-usable, time and time again.

EXTRA Fast . . . simple, one-piece construction allows installation over two maximum size conductors without disassembly. No falling off line during assembly.

EXTRA Dependable . . . positive high-pressure clamping action maintains low-resistance contacts. Design of "jaws" provides complete enclosure of the conductors.



DuraGrip "DG" CONNECTORS

The answer to any problem of high-pressure contact in their cable range . . . especially designed to meet today's increasing loads on distribution systems. The extra clamping strength of Anderson's "DG" Connectors assure trouble-free, long-life connections. Long, strong "jaws" plus long silicon bronze bolts combine to provide linemen with a truly "fumbleproof" connector that will save time and eliminate handling difficulties. They will "hang" without turning over . . . no nuts to lose . . . no need *ever* to completely disassemble.

Catalog Number	Cable Range Max. Solid	Cable Range Max. Str.	Max. Nominal Cable Diameter
DG-8	6	8	0.162
*DG-8SH	6	8	0.162
DG-6	4	6	0.210
*DG-6SH	4	6	0.210
DG-4	3	4	0.233
DG-2	2	3	0.258
DG-1	1	2	0.292
DG-1/0	2/0	1/0	0.368
DG-2/0	3/0	2/0	0.414
DG-4/0	4/0	4/0	0.522

*Furnished with slotted head bolts

NOTE: Minimum clamping range is one maximum conductor.

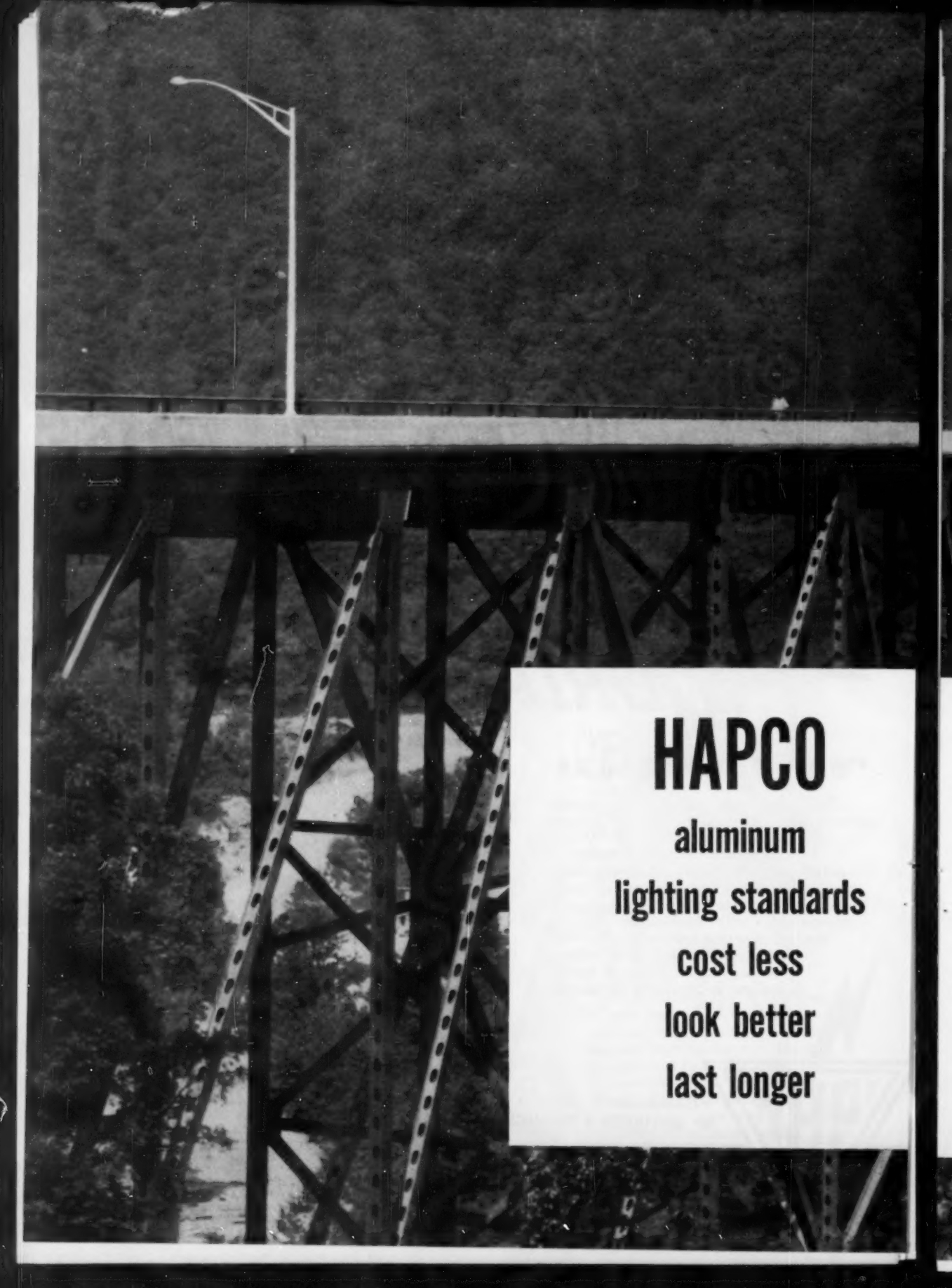
FOR MORE COMPLETE INFORMATION . . . consult your nearest ABW representative or contact our home office.

ABW

Aluminum & Bronze POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES
for SUBSTATION • TRANSMISSION • DISTRIBUTION SYSTEMS *for over a Quarter Century*

ANDERSON BRASS WORKS, INC.

P. O. DRAWER 2151 BIRMINGHAM 1, ALABAMA


HAPCO
aluminum
lighting standards
cost less
look better
last longer

Hapco Lighting Standards cost less than other lighting standards when installed costs are carefully figured. In most cases, this saving is apparent as soon as the standards are erected. In a few areas a short period of service may be required before the costs drop below other types of standards. At this point the advantage continues to increase as long as the standards are in use.

The major reason for lower costs, as soon as the standard is put into service, is that Hapco Poles and Lighting Standards do not require that first painting job, nor any subsequent maintenance painting. Therefore, you can deduct the cost of the paint and the labor of applying it.

As for appearance, users all agree that the silver grey, Venetian column design of these standards has top eye appeal. Hapco Standards cost less, look better and last longer.

For more details, see your nearest distributor or write direct to Hubbard Aluminum Products Company, 6301 Butler Street, Pittsburgh 1, Pennsylvania. Better yet, if you have not received our 24-page Hapco Catalog on Street Lighting Standards (Catalog No. HAL-754), write to the above address for your copy. This catalog contains valuable information to help you plan the most efficient, most beautiful highway and street lighting, as well as any other outdoor lighting.

HUBBARD ALUMINUM PRODUCTS COMPANY
Division of Hubbard & Company
Pittsburgh 1, Pa.

PAGE chain link FENCE

America's First Wire Fence—since 1883

• When next you need fence as protection against common hazards you certainly will want time-tested quality in the safeguard you provide. Whether you choose heavily galvanized Copper-Bearing Steel, corrosion-resisting Aluminum, or long-lasting Stainless Steel, PAGE Fence is quality controlled from raw metal to rugged fence erected on metal posts deep-set in concrete. Available are 8 basic styles, varied by heights, types of gates, top rails, and barbed wire strands for added security. Finally, your PAGE Fence will be expertly erected by a reliable, technically trained firm. For important fence data and name of nearest PAGE firm—

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia or San Francisco.

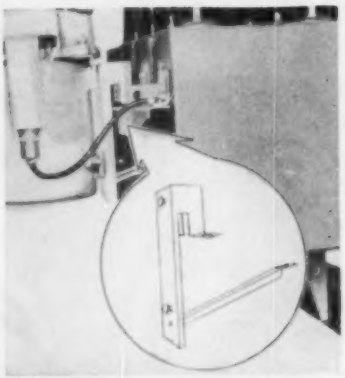
PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

New Equipment

(*Continued from page* 162)

space than the previous three single contact molded supports, makes possible the new CT location. The CT used is a new "window" design and will be available in all standard ratings from 100 to 800 amp primary and 5 amp secondary. The 600 and 800-amp ratings will have ASA accuracy of 0.3B0.2, which is metering accuracy.

General Electric Co, 1 River Rd, Schenectady 5, N. Y.



Capacitor Bracket

Capacitor switch bracket permits conversion of fixed pole-top banks to automatically switched units. The galvanized steel bracket is said to enable users to mount type CSO capacitor switches on standard three- or four-unit mounting brackets without removing capacitor units or lifting assembly from the pole.

Westinghouse Electric Co, Box 2099, Pittsburgh 30, Pa.

Suspension Insulator

A 10-in. suspension insulator, in EEI-NEMA class 52-3, is said to be particularly applicable in the corrosive atmosphere of coastal and industrial areas.

The insulator has a cap made of malleable iron which is hot-dip galvanized (it is also furnished with a Corten cap) and a stainless steel pin. As a result of this corrosion-resistant feature, the insulator is claimed to have a low radio noise level.

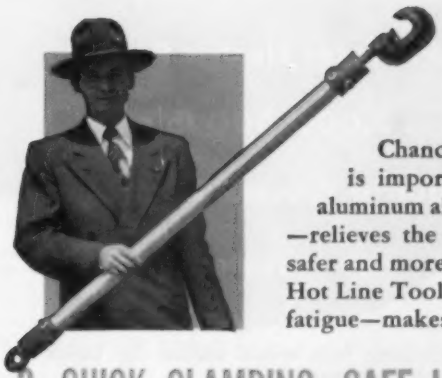
(*Continued on page* 170)

CHANCE *MAPLAC** HOT LINE TOOLS

offer these 3 Important Advantages!

1.*PLASTIC PROTECTION

The poles used on all Chance Hot Line Tools are completely sealed and protected with a super-tough, crystal-clear plastic finish that resists surface abrasion—is unaffected by oil, grease, gasoline, or salt water—that perfectly seals joints around metal fittings—that retains its toughness under widely varying temperatures—and can be readily repaired without special tools or heat if the coating should be cut by a sharp blow. This "Maplac" coating offers great moisture resistance and has electrical resistivity that exceeds the voltage withstand tests of the wood insulation.

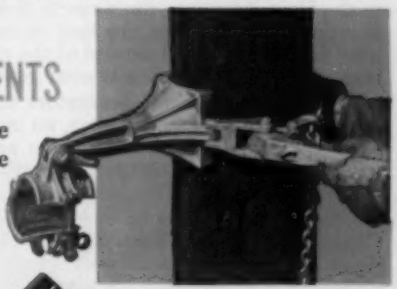


2. ALUMINUM FITTINGS

Chance Hot Line Tools are lighter in weight, where the weight is important, because the end fittings are made of heat-treated aluminum alloy. This weight reduction—with larger, stronger fittings—relieves the strain on the lineman—making hot stick work easier, safer and more efficient. Ask the men who use them! They prefer Chance Hot Line Tools because their light weight and good balance cuts down fatigue—makes them easier to use.

3. QUICK CLAMPING, SAFE LOCKING ATTACHMENTS

All Chance Hot Line Tools which require mounting on poles are equipped with this light weight chain tightener that clamps the tool quickly to the pole by a simple lever operation. A specially designed safety catch automatically and securely locks the tool support in place. The latch cannot be released unintentionally or accidentally. A half link adjustment of the chain assures a snug fit on any pole.

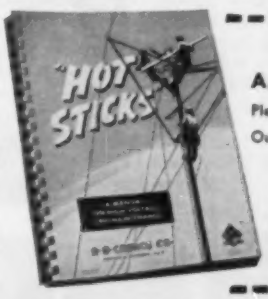


NEW... a manual on **how to do Hot Line Work**

162 pages of detailed explanations—with hundreds of drawings and diagrams that show every important operation.

Supply your line crews with this valuable aid to safety. Price is $2.50 a copy. Use the coupon at right to place your order.

CH59-14A



ABC Approved

A. B. CHANCE CO. • 205 N. Allen St. • Centralia, Mo.

Please send us _____ copies of "Hot Sticks" priced at $2.50 a copy.

Our check for $_____ is enclosed. Bill us for _____ copies.

NAME _____

TITLE _____

COMPANY _____

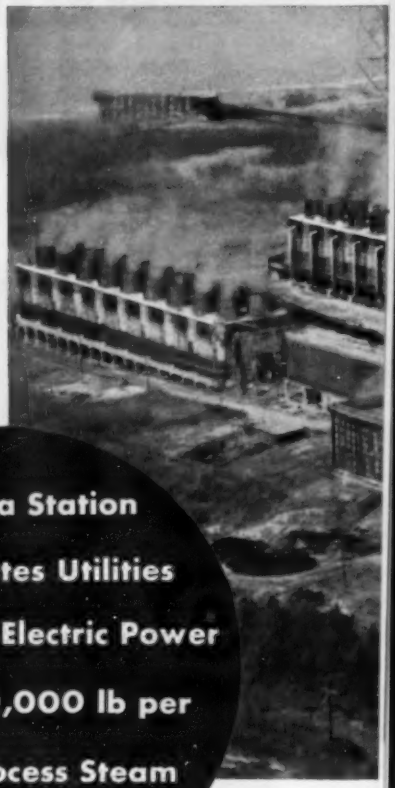
ADDRESS _____

CITY _____ STATE _____

Utility provides both steam

This Fact Makes It *doubly important*

That Switchgear Provide Uninterrupted Power for Auxiliaries



Louisiana Station of Gulf States Utilities Co. Provides Electric Power plus 3,000,000 lb per hour of Process Steam for Industry

TWO lineups of Allis-Chalmers station auxiliary switchgear are used in this plant. Engineered by Stone and Webster, it is one of the largest steam plants in the United States. Since much of the process steam is supplied to refineries, the load factor is high and the need for continuity of service of the station auxiliaries is especially critical. Gas is used as the principal fuel.

There are 12 turbine-generators in the plant. This division of the load is, of course, an important factor in continuity of electrical service. In addition, the electrical schemes used assure an uninterrupted power source for auxiliaries.

There are 13 units in one of the lineups of Allis-Chalmers switchgear and 28 units in the other. A brief description of the new 28-unit lineup in the new plant extension will illustrate the planning employed.

The 28 switchgear units are made up into three bus sections, with each section controlling auxiliaries for a separate boiler.

Under normal operating conditions each bus section is energized by its respective transformer. Tie breakers between the sections are open.

But in the event of trouble any two of the three transformers can feed all three bus sections.

On each bus section there are: one boiler feed pump, two forced draft fans, and two induced draft fans. In addition, there is a fourth boiler feed pump on one bus section which can take the place of any of the other three boiler feed pumps. In the event of failure of either one of the two forced draft or induced draft fans, the remaining fans would enable the boiler to carry half its normal load.

Overcurrent relays on all feeders and bus tie breakers will trip and lock out associated circuit breakers and close an annunciator contact for alarm. Long time overcurrent relays are used on motor feeders.

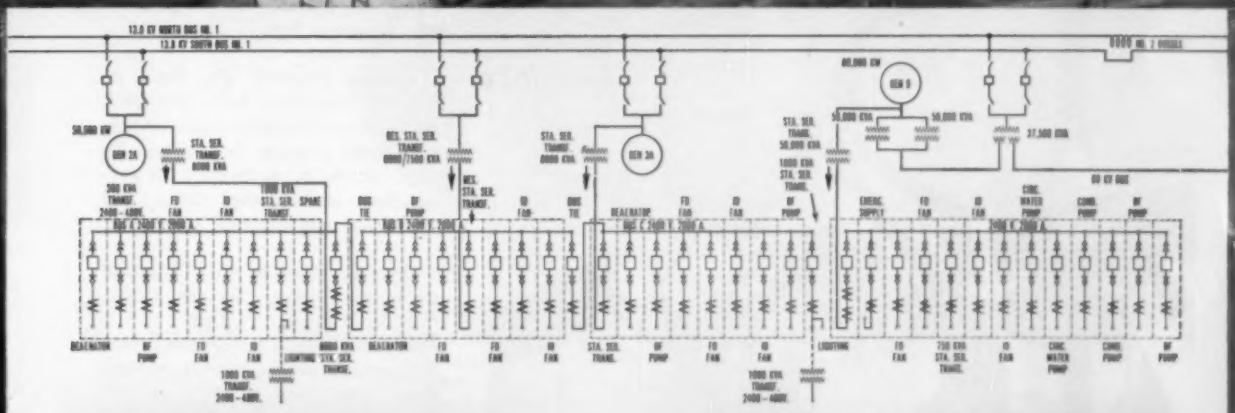
Interlocking in switchgear assures proper sequence of operation of auxiliaries.

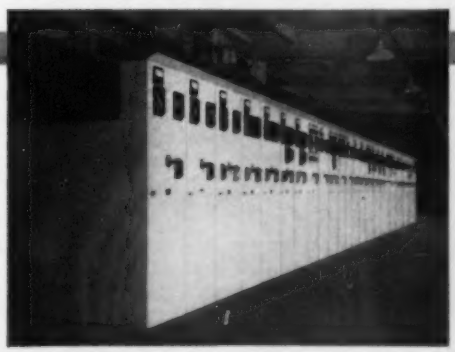
★ ★ ★

Allis-Chalmers engineers worked in close cooperation with both Stone and Webster and Gulf States Utilities Company engineers. This is one of many auxiliary lineups built by Allis-Chalmers. For information about Allis-Chalmers switchgear, call your nearby A-C office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4791

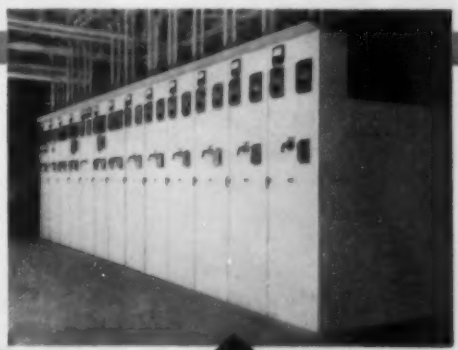
ALLIS-

and electricity for refineries





Special drip-proof design was furnished for both lineups of Allis-Chalmers Metal-Clad Switchgear.



CHALMERS

A-C ALLIS-CHALMERS

Prevent Corrosion of
BI-METAL SERVICE ENTRANCE CONNECTIONS
with
BI-SEAL
Bi-Seal Self-Bonding (polyethylene based) Electrical Tape is the ideal insulating medium for aluminum-to-copper service entrance connections. The maximum moisture protection of Bi-Seal prevents electrolytic action... its performance is as good as the original insulation ... Bi-Seal's low-temperature workability, aging qualities and high dielectric protection mean uninterrupted operation... even under extreme weather conditions. Bi-Seal molds perfectly over the most complex shape, and is recommended for all types of service entrance connections. It's just one of Bishop's family of outstanding tapes for every splicing need.
Complete information on Bi-Seal and other Bishop tapes is available on request.
Photograph courtesy of Kaiser Aluminum Co.
BI-SEAL
BISHOP
MANUFACTURING CORPORATION
6 CANFIELD ROAD
CEDAR GROVE (ESSEX CO.) N. J.

New Equipment

(*Continued from page* 166)

Insulators are distributed by Line Material Co, Milwaukee 1, Wisc.
Illinois Electric Porcelain Co, 510 N. Pearl St, Macomb, Ill.

MORE NEW PRODUCTS

Murray Mfg Corp, 1250 Atlantic Ave, Brooklyn 16, N. Y., offers Type "G" **safety switches** in sizes from 30 to 200 amp. They are fusible, single-throw, side operated and are provided with solderless lugs.

Unistrut Products Co, Dept. A, 1013 W. Washington Blvd, Chicago 7, Ill., is introducing lightweight, all-purpose **metal framing** channel and fittings. Series "A" is designed for construction of shelving, racks, and mechanical and electrical supports.

General Electric Co, Trumbull Components Dept, Plainville, Conn., has:
Fuse puller devices for light industrial, commercial and residential applications. They have as many as four fuse pullers and up to 20 plug fuse branch circuits, all rated for 120/240 v, ac, single-phase, three-wire service. **Single-pole high-shock circuit breakers** for use on shipboard lighting and power circuits. Available in 50-amp frame sizes.

Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, Ohio, offers a **positioning relay kit** for field application to any air-operated control valve.

Hogart Engineering Co, 1050 S. Olive St, Los Angeles, Calif., offers the Page Sensor pocket model **explosive gas indicator.** Unit operates on 2 small pen light batteries.

Enjay Butyl Cuts Cable Costs

The rapidly expanding use of Enjay Butyl in underground cable insulation is still another example of how it cuts costs . . . *and* does a better job.

Enjay Butyl high voltage compounds have extraordinary resistance to ozone and corona. They show high insulation resistance, are very stable to temperature change, and have power factor and dielectric properties which are superior to other insulation materials. Exceptional low-temperature flexibility, excellent resistance to heat and aging, and resistance to moisture absorption and abrasion are still further benefits.

Enjay Butyl offers three outstanding features: *excellent electrical* properties, a *definite price advantage*, and *immediate availability*. They may well help *you* in cutting costs and increasing the performance of your product. Get all the data on this extremely versatile, low cost rubber by contacting the Enjay Company today. Take advantage of our complete laboratory facilities and skilled technical assistance.

ENJAY BUTYL

Enjay Butyl is the super-durable rubber with outstanding resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

ENJAY

ENJAY COMPANY, INC., 15 West 51st St., New York 19, N. Y.
District Office: 11 South Portage Path, Akron 3, Ohio

35 SUCCESSFUL YEARS OF LEADERSHIP IN SERVING INDUSTRY

Even rocks won't stop this Tel·E·Lect digger!

- **Time Tested, Proven, Accepted**
- **Used by Public Utilities Everywhere**
- **Operates on Any Derrick Truck**
- **Nationwide Sales-Service Facilities**

Rugged construction from hardened steel auger to power take-off lets this time-tested Tel-E-Lect Pole Hole Digger work in all soil conditions . . . smart design lets Tel-E-Lect's digger reach up on hills, down into ditches, or across obstacles—anywhere up to 20 feet behind the truck!

Put this low cost, industry accepted unit on the front or rear of your utility truck . . . see your two-man crew dig a hole and set a pole in less than five minutes. The Tel-E-Lect digger will bore clean holes 10 feet deep. Interchangeable augers 8" to 20" in diameter are offered.

The digger is lifted by truck's boom and winch. Engine power is delivered to the digger through a telescoping drive shaft and the auger can be rotated in either direction by shifting the PTO.

All Tel-E-Lect products are sold and serviced through a nationwide distributorship plan. You'll find your local dealer listed under "Trucks-Equipment" in the yellow pages, or *write direct for complete information.*

This 2-man utility truck is completely equipped by Tel-E-Lect. Its derrick and digger are stowed overhead for travel.

Once on the job, the derrick and digger are raised automatically with the winch . . . no need for a big crew with this compact unit.

In two minutes the Tel-E-Lect derrick and digger are in position, ready to work. Note that the pole is used as additional weight to force the auger into the frozen ground.

Tel·E·Lect PRODUCTS, INC.

10,003 Minnetonka Boulevard Minneapolis 16, Minnesota

More New Products

(*Continued from page* 170)

Perkins Engineering Corp, 345 Kansas St, El Segundo, Calif., offers a line of magnetic amplifier **voltage regulators** built to customer specifications.

Revco Inc, 2 E. Franklin, Minneapolis, Minn., has a ⅓ hp variable **speed reducer** with a torque rating of 30 in.-lb throughout its speed range of true zero to ¼ input speed.

Doerr Electric Corp, Cedarburg, Wisc., offers NEMA 42 frame **gearmotors** in 1/20 and 1½ hp ratings. Available in eight speed ratios in the range from 5:1 to 60:1.

Ingersoll-Rand, 11 Broadway, New York 4, N. Y., has added a 125 hp electric-driven **air compressor** to its line of two-stage Type 40 stationary compressors.

Minneapolis-Honeywell Regulator Co, Micro Switch Div, Freeport, Ill., offers an illuminated **pushbutton switch** with an indicating light as an integral part of the button.

Osmose Wood Preserving Co of America, Inc, Utilities Div, 980 Ellicott St, Buffalo, N. Y., has **bandaging material for wood poles** which is said to be durable and easy to apply.

Bart-Messing Corp, 229 Main St, Belleville 9, N. J., has a lightweight regulated **dc power supply** designed for computers and other applications requiring close voltage regulation.

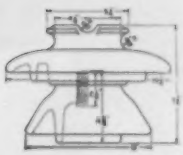
Stoddart Aircraft Radio Corp, Inc, 6644 Santa Monica Blvd, Hollywood 38, Calif., has a hinged **electronic probe** for the measurement of radio-frequency current and interference in conductors up to 1 in. diam.

Sylvania Electric Products Inc, 1740 Broadway, New York 19, N. Y., has a line of porcelain **enameled reflectors** for high bay mercury vapor or incandescent lamp mounting.

Servo Corp of America, 2020 Jericho Turnpike, New Hyde Park, N. Y., offers **heat detector cell** Type 1317 for remote detection of far infrared energy in heat detection, measurement and control systems.

America's Finest!

VICTOR NO. 245
TRANSMISSION
PINTYPE
(Radio-Freed or Plain)



VICTOR
Purified Porcelain
Transmission Pintypes

VICTOR Transmission Pintypes are America's finest because VICTOR "Know-How" has endowed them with extra long life under even the most severe conditions of service. Made of VICTOR *Purified* Porcelain—they are the finest insulators skilled craftsmen and modern research can produce. Victor Transmission Pintypes are designed with thick, rugged, rounded corrugations for maximum strength and resistance to impact. They have large radius top and side-wire grooves to permit use of new larger conductors, and smooth hard glaze that protects against weathering and contamination. Each is thoroughly inspected at every stage of manufacture. You just can't buy a better insulator!

FEATURES

1. **UNEQUALLED STRENGTH,** thanks to Purified Porcelain—finest insulator porcelain ever made!
2. **CUSHION-COATED JOINTS**—special coating at joining surfaces absorbs thermal variations and mechanical shock.
3. **THICK, RUGGED CROSS-SECTION** plus rounded edges give maximum strength, protection against impact, cut replacement costs.
4. **LARGER RADIUS TOP AND SIDE WIRE GROOVES** permit the use of new, larger conductors.
5. **SCIENTIFICALLY COMPOUNDED GLAZE** gives maximum strength and a smooth, self-cleaning surface.
6. **CONTROLLED TESTING AND PROCESSING OF CEMENT** assure highest bond strength at assembly joints.

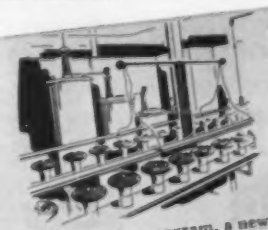
SPECIFICATIONS

60 cycle dry flashover	125 KV
60 cycle wet flashover	80 KV
Positive impulse flashover*	200 KV
Negative impulse flashover*	265 KV
Dry arcing distance	9⅛"
Leakage distance	21"
Pinhole diameter	1⅜"
Rec. pin height	8"
Cantilever strength	3000 lbs.
RNI (plain)	16,000 microvolts
RNI (radio-freed)	200 microvolts
1000 KC at applied	30 KV

*Crest KV. 1½ x 40 microsecond wave Critical Value.

For the full facts on Victor "Know-How," write for "The Story of Victor and Purified Porcelain." For engineering data on Victor insulators, write for Bulletin No. 4.

NEWS FROM VICTOR



As part of its continuing modernization program, a new 60 cycle, 225 KV continuous flashover tester has been installed in the VICTOR plant. By means of this new equipment, the operator is able to attain more accurately regulated 60 cycle flashover to a definite time standard, thus attaining maximum effectiveness in conducting routine flashover tests.

SPECIFY VICTOR
Purified Porcelain
Pintypes

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

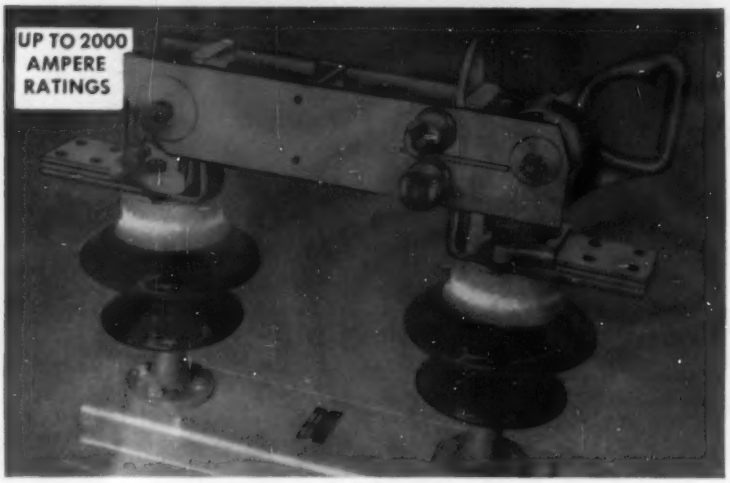
Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelains
Insulator Hardware

Terminal to Terminal

CURRENT TRAVELS A

CONTINUOUS-COPPER-PATH

THROUGH USCO'S "HH" HI-PRESSURE HOOKSTICK SWITCH



Available 7.5-69KV, 400 through 2000 Ampere ratings
Shown is 15KV 2000 Ampere

Both the hinge and jaw employ one-piece bus bar copper to form the contact post and its terminal pad, permitting current flow through an all-copper path. This and the following features combine to give you more for your switch-purchasing dollars:

- Large 3" diameter operating ring with 3 to 1 cam-out leverage
- Blade guide assures positive blade alignment
- Blade latch precludes opening except by deliberate action
- Hi-pressure line contacts—jaw *and* hinge—with silver to copper surfaces
- Heavy duty trussed blade with wide spacing between bars
- Galvanized steel wing-channel (illustrated) or regular channel base
- Hot-dip-tin terminal pads when specified

ALL COMPONENT PARTS OF USCO SWITCHES ARE DESIGNED AND MANUFACTURED IN OUR FACTORY

For full details, write directly to:

USCO

USCO Power Equipment Corp.

829 North 36th Way, Birmingham 4, Alabama — Phone 59-7241

Designers and manufacturers of high voltage electrical equipment

CATALOGS • BULLETINS

● **CURRENT ANODES:** Impressed current anodes for cathodic protection are described in Bulletin DA/1. Chemical, mechanical and physical properties are listed along with information on various uses. Duriron Co, Inc, Dayton 1, Ohio.

● **TAPE:** Bulletin No. 455 lists electrical, physical and chemical properties of various electrical insulating tapes. Recommended uses and methods of application are included. Bishop Mfg Co, 6 Canfield Rd, Cedar Grove, N. J.

● **BULLETINS:** Following are available from Allis-Chalmers Mfg. Co, 932 S. 70th St, Milwaukee 1, Wis.

DRY-TYPE TRANSFORMERS: Totally-enclosed dry-type transformers with NEMA Group 3 class insulation for indoor or outdoor applications are described and illustrated in Bulletin 61B8222, 4 pages. Construction details are given along with dimensions and ratings.

LIQUID RHEOSTAT: Bulletin 14B8231, 8 pages, describes features of Type 257 liquid rheostat and tells of various applications. Approximate weights and dimensions are also given.

ELECTRIC PUMPS: Model C-3 supporting adapter "Electrifugal" pumps are described in Bulletin 52B6083C. It gives frame sizes, dimensions and ratings of units with capacities to 2500 gpm, heads to 400 ft and temperatures to 250 F.

● **DISTRIBUTION TRANSFORMERS:** A 4-page bulletin describes and illustrates construction features of permanently sealed distribution transformers in 5, 10, 15 and 25 kva ratings, without taps, for voltages from 2.4 to 14 kv. Pennsylvania Transformer Co, Cannonsburg, Pa.

● **INVENTORY CONTROL:** Brochure KD-406, 16 pages, tells how inventory control can balance stocks and reduce costs for manufacturers. It describes various products and their functions in maintaining inventory control. Remington Rand Inc, 315 Fourth Ave, New York 10, N. Y.

● **MOBILE GENERATING UNITS:** A series of six booklets covering mobile diesel generating units is available from General Motors, Electro-Motive Div, La Grange, Ill. Titles and contents are as follows:

Maintaining Service During Cutover—Report on case example in which mobile units provide second power source during cutover of a distribution system.

When Do Diesel Generators Fit The Utility Picture?—Report on development of a formula to determine economic advantages of mobile units.

Peaking At Load Centers—Report on case example in which mobile diesel generating units reduce line losses in supplying power during peak load periods.

Mobile Diesel Generating Power Saves $16,813 a Year—Report on case in which these units save $16,813 a year over fixed charges.

Diesel Generators Postpone Transmission Investment—Case example in which mobile units postpone major line revision.

Mobile Diesel Generator Solves Line Rebuild Problem—Case in which mobile units postpone line investment.

● **APPARATUS BUSHINGS:** Various phases of high-voltage apparatus bushing operation are covered in detail in a booklet entitled, "Guide to Periodic Inspection and Repairs of Apparatus Bushings". Locke Dept, General Electric Co, Box 57, Baltimore 3, Md.

● **POLAR RELAY:** Bulletin RH-7 gives electrical characteristics, travel time and other details of a polarized relay for use in teletypewriter repeater circuits, teletypewriter switching, and similar applications. Automatic Electric Sales Corp, 1033 W. Van Buren St, Chicago 7, Ill.

STUBBORN!

Chase® Antimonial Admiralty Condenser Tubes
RESIST DEZINCIFICATION!

Dezincification holds no fears for the users of Chase Antimonial Admiralty Condenser Tubes! For *this* special alloy can give *year after year* of extra service under the most corrosive conditions!

Rugged testing in Chase laboratories, plus careful manufacturing in Chase mills, team up to give Chase Antimonial Admiralty a longer, healthier life span. To you, this can mean lower operating costs, fewer breakdowns, longer waits between tube replacements.

Enjoy these benefits! Insist on Chase Antimonial Admiralty!

Prompt Delivery from Cleveland and Waterbury Mills

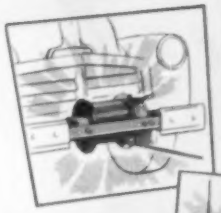
Chase®
BRASS & COPPER CO.
WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

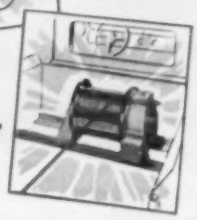
Albany†	Chicago	Detroit	Los Angeles	New York	St. Louis
Atlanta	Cincinnati	Grand Rapids†	Milwaukee	Philadelphia	San Francisco
Baltimore	Cleveland	Houston	Minneapolis	Pittsburgh	Seattle
Boston	Dallas	Indianapolis	Newark	Providence	Waterbury
Charlotte†	Denver	Kansas City, Mo.	New Orleans	Rochester†	(†sales office only)

Only Gar Wood gives

BIG WINCH SAFETY and dependability



for light utility trucks



Choice of standard or low-mount

Compare these features!

Here are 6 reasons why the new 7000-lb. Gar Wood winch will outperform any other winch in its class:

- Exclusive aluminum housing permits lighter weight, faster dissipation of heat.
- Fully enclosed non-slip clutch assures unequalled free control at all times. No sticking! No rusting! No freezing!
- Built-in rope clamp gives better spooling, simplifies attaching and changing of rope, ends danger of rope snagging.
- Self-energizing safety brake automatically stops and holds any load you can handle.
- Self-contained ball-bearing mounted worm shaft assures smoother operation, needs no adjustment.
- Extra rugged base angles guarantee safety many times rated capacity of winch.

GAR WOOD *Winches*

GW-W-2

MAIL COUPON FOR QUICK ACTION

Gar Wood Industries, Inc.
Main St., Wayne, Michigan

☐ Send free literature on new 7000-lb. Gar Wood Winch

☐ Std. Mount ☐ Low Mount

Name .....

Title .....

Company .....

Address .....

TECHNICAL LITERATURE

NEMA STANDARDS—The following are available from National Electrical Manufacturers Assn, 155 E. 44th St, New York 17, N. Y.:

WC 1-1955 Asbestos, Asbestos-Varnished Cloth and Asbestos-Thermoplastic Insulated Wires and Cables. Contains detailed information on construction, identification, insulation and testing of the following types of wires and cables: A, AA, AI, AIA, AVA, AVB, AVL and TA. Price $3.00.

EW 1-1955 Electric Arc-Welding Machines and Electrodes. Covers the rating, testing and manufacture of dc and ac arc-welding generators and motor-generators, ac transformers, and rectifier-type arc-welding machines. Price $2.25

No. 220-1955 Mercury-arc Power Rectifier Units. Contains general standards, supplementary information and definitions for: Electrochemical rectifier units, industrial rectifier units for ungrounded two-wire service, mining rectifier units and transportation rectifier units. Price $2.00

CA 1-1955 Shunt Capacitors. Gives standards and information about the rating, manufacturing, testing, application and operation for capacitor units of ½ kva and larger for power factor improvement and other low-frequency ac applications, and assemblies of capacitor units with accessories and control to form complete capacitor installations. Price $2.00

CORROSION—More than 4,400 abstracts and 4,000 authors are classified and indexed in the 1950-51 Bibliographic Survey of Corrosion. It includes abstracts of corrosion literature published in these years. Price: $10 to association members, $12.50 to non-members. National Assn of Corrosion Engineers, 1061 M&M Bldg, Houston 2, Tex.

FIRE SAFETY STANDARDS—The following are available from the National Fire Protection Assn, 60 Batterymarch St, Boston 10, Mass.:

No. 71 Standards for installation, maintenance and use of central station protective signalling systems for watchman, fire alarm and supervisory service—26 pages. Price 25¢.

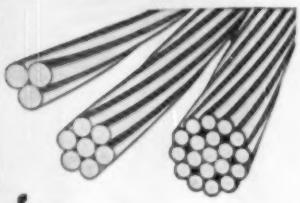
No. 72 Standards for installation, maintenance and use of proprietary auxiliary, remote station and local protective signalling systems for watchman, fire alarm and supervisory service—40 pages. Price 35¢.

THERMOCOUPLES—Circular 561 contains expanded reference tables for platinum-platinum-10%—rhodium, platinum-platinum-13%—rhodium, chrome-alumel, iron-constantan, copper-constantan and chromel-constantan thermocouples with temperature in degrees Centigrade and Fahrenheit, and electromotive force in millivolts as the arguments. Tables are based on absolute electrical units and International Temperature Scale of 1948. Circular contains 22 tables on 84 pages. Price 50¢. Government Printing Office, Washington 25, D. C.

PLASTICS—"Mechanical Properties of Rigid Plastics at Low Temperatures" is a 143-page test report prepared by the Army Ordnance Corps. This report contains design data and information on low-temperature properties of 56 different rigid plastics representing all commercially available types. These include a variety of laminated, molded, and cast thermosetting materials as well as cellulose, polystyrene and poly-methyl thermoplastics. Properties tested at temperatures ranging from —65F to +77F included tensile modulus of elasticity, proportional limits, elongation at break, ultimate tensile strength, Izod impact strength and work-to-produce failure. Report PB 111579 also contains charts and analyses of the performance of each of the plastics tested. Price $3.75 Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D.C.

ACCO Quality

PAGE Stainless Steel Strand



for Severe Service Conditions

PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! Its lower cost per year of use means long-range economy.

Write us at Monessen, Pa., for complete information

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PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

for Better Value

Hot-Line Maintenance
SAFELY AND ECONOMICALLY

P.P. #66200 - 6" - Strain Insulators
are specifically designed for HOT-LINE WORK.

There's MORE space between the skirt of the insulator and the clevis pin for hot-sticks. Also, the extra long clevis pin gives more gripping surface for the jaws of the hot-stick.

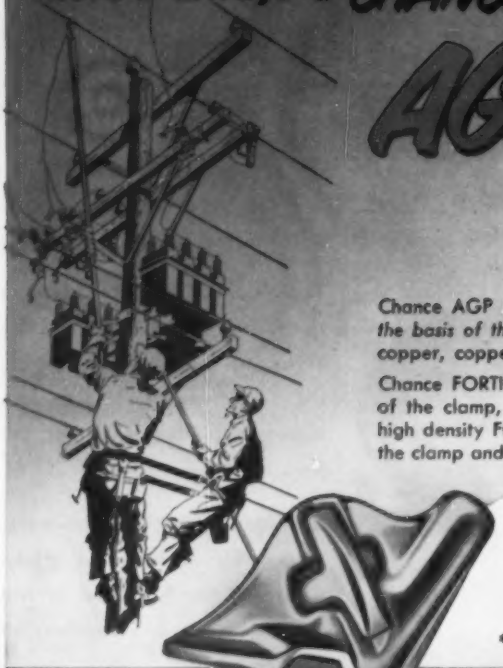
Linemen, having space to work, work more quickly and safely. They get the job done in less time with no interruptions of service.

PP INC.

Porcelain Products, Inc. / **Parkersburg, West Virginia.**

There's always a CHANCE for a better connection . . .

AGP* proved best by test for joining aluminum and copper conductors



Chance AGP Clamps, approved by power company after power company on *the basis of their own tests,* can be used for all types of connections: copper to copper, copper to aluminum, aluminum to aluminum, and aluminum to copper.

Chance FORTIFIED cadmium coating, applied .001" thick to the aluminum body of the clamp, resists corrosion and electrolysis in all types of connections. This high density FORTIFIED cadmium coating gives extra long life protection to both the clamp and the conductor.

AGP tap clamps have the advantage of light weight which lengthens conductor life by minimizing the effects of vibration and makes them easy to handle on a clamp stick . . . plus easy identification with the RED EYE SCREW—plus their most important feature, their versatility. You can reduce your inventory and greatly simplify your stocks by standardizing on AGP.

* Aluminum General Purpose

Chance "P.C." (Protected Connection) Clamps

Complete thread protection for easy installation and removal. No threads are ever exposed except in the extreme opened position. Wide jaws contact all strands.

Chance Perma-Grip Tap Clamps

Here's a service-proved tap clamp for all general applications. Gripping jaws of this clamp make a three-point contact with conductor.

Chance AGP Parallel Groove Clamps

Here's a Parallel Groove Clamp for all conductor combinations that doesn't need an insert and can't be put on wrong. Either side will take copper or aluminum and give you the best parallel groove clamp connection you can get. The wide jaws of this clamp contact every strand of the conductor making a positive, high conductivity connection.

Each size covers a wide conductor range.

Micro-photo below compares Chance A.G.P. fortified cadmium coating (left) to commercial plating, one reason for A.G.P.'s success. Get the full story.

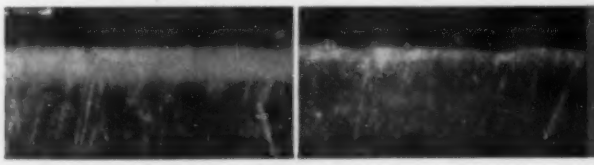
Chance z.l.n. 100— Electrical Contact Sealing Paste

Application brush available for hand use or hot stick.

For use with hot line clamps, bolted and compression type connectors.

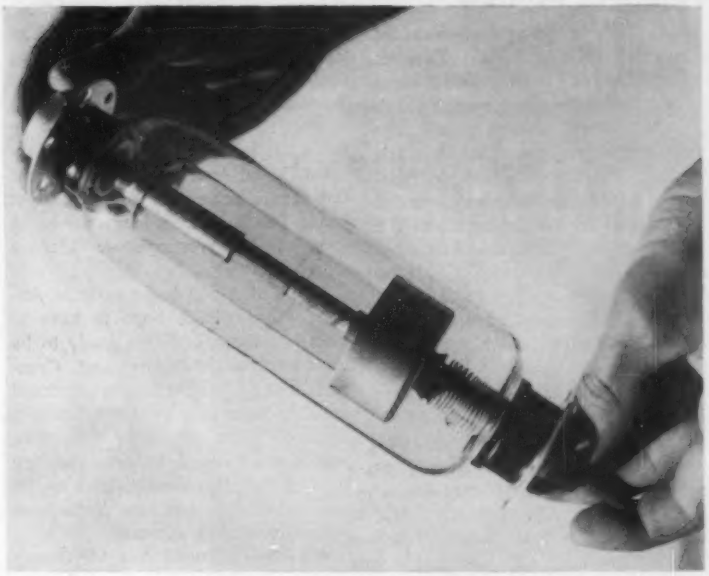
1. Protects any bimetal combination against corrosion and **2.** Improves conductivity. **3.** Z.l.n. 100 is waterproof and stays plastic. **4.** Will not melt under 340° and **5.** Can be "worked" at 25° below zero. **6.** Non-toxic. **7.** Non-inflammable. Available in 5 fluid oz. tubes or 1 qt. cans.

CC55-8



A·B·CHANCE CO·

CENTRALIA, MISSOURI



POWER ENGINEERS witnessed four of these small vacuum switches in series repeatedly drop 150 miles of 230-kv line at first current zero without restrike

Vacuum Switch Shows Promise

A small switch of unique design that uses high vacuum for circuit interruption has recently undergone a series of tests culminating in successful 230-kv line dropping on the Bonneville Power Administration system, according to a report first published in Electrical West for July.

Jennings Radio Mfg Co of San Jose, Calif., and Schwager-Wood Corp of Portland, Ore., two firms that have been cooperating on the application of vaccum switches in the power field, supplied the necessary equipment for the tests.

The BPA tests, wherein a 150-mile section of 230-kv line was dropped without restrike by four small vacuum switches per phase, were conducted May 8, Electrical West stated. Interruption at first current zero was attributed to low inertia of moving parts and high vacuum in the small switches.

The small glass-enclosed vacuum power switches are an outgrowth of the vacuum switches made by Jennings for switching the high-voltage circuits in radio, radar and television transmitters.

The device is about eight inches long and three inches in diameter. The glass envelope is fused with the metal end caps; upper electrode is stationary; and the lower electrode is actuated through metallic bellows, the small bronze bellows proved by its use in automobiles and in millions of refrigerators.

The degree of vacuum is described by the manufacturer in this way: If it be *assumed* that the molecules in air at sea level were one-eighth of an inch apart, then in the vacuum switch they are a mile apart. This makes it understandable how the switch with ⅜-in. separation of the tungsten electrodes will withstand 300,000 v. With high vacuum and very small inertia of the moving parts, the arcing time is practically zero.

In the BPA tests, the first unit tested consisted of eight vacuum switches in series but it was found that four switches in series were capable of breaking the 230-kv line, which was 150 miles in length.

Extensive 60-cycle power switching tests have been conducted at the Jennings plant over a period of several years. The 12-kv, three-phase plant service has been switched with three of the vacuum switches for some time. In addition, switching and overcurrent protection in all 230-v plant feeders is provided by high current rated vacuum switches.

Because of the merits of the device for switching power system capacitor banks, Jennings has conducted much research and extensive testing in this field at its San Jose plant.

Field Tests

In 1954 A. C. Schwager of Schwager-Wood joined with Jennings in making field tests in the power field. The first such test was made in the fall of that year on the system of the California Oregon Power Co. A 100-mile, 115-kv line was successfully dropped with three switches in series per phase. With one, there was an external flashover as was to be expected, but it did not damage the switch. Two of course, did not show any surface arc-overs.

In the spring of 1955 concurrent tests were made at the Schwager-Wood plant in Portland and by the Los Angeles Department of Water & Power, opening capacitor banks. At Portland tests were run with a single vacuum switch opening 250 amp at 20 kv.

E. G. Olmsted, transmission system engineer for the Los Angeles utility, reports on their tests as follows: Three type R-8 vacuum switches were connected between a three-phase, 4,800-v power source and a 300-kvar shunt capacitor bank connected in delta. Normal capacitor current through the switches was 40 amp but the initial inrush current was very large as the tests were conducted near a large substation. The switches were closed and opened once a minute for 10,000 complete operations. There was no measurable evidence of contact wear or loss of dielectric strength. During these tests the operating condition of the vacuum switches was checked from time to time by oscillograms.

Dr R. W. Sorensen of the California Institute of Technology had shown some 30 years ago that a vacuum switch held forth great promise in the power field. At that time the knowhow of creating and holding high vacuum had not been developed.

It took the atomic age and developments in the electronic industry to bring forth the techniques that have made possible the present vacuum switch. One of the switches is shown.

(*More M & M on next page*)

1½ kva too small?

G-E Service Shop

uprates to 5 kva!

There's lots of life in your old distribution transformers yet! Just let your local G-E Service Shop replace the old cores and coils with new factory-built units of higher kva capacity. Your transformers are returned good as new. There are 31 G-E Service Shops throughout the country—one near you. 431-33

Progress Is Our Most Important Product

GENERAL ELECTRIC

A-C Bid Wins Tacoma Generator Contract

Allis-Chalmers Mfg Co was awarded a contract July 13 by the Tacoma, Wash., Board of Contracts and Awards for generators required on the City's Cowlitz hydroelectric project. The contract amounting to $2,595,000 is for four 45,000-kva, 128.6-rpm generators. S. Morgan Smith was awarded the contract for the hydroturbines.

The generator contract was awarded after a re-advertisement for bids on July 6 and bid opening on July 11. First bids were advertised on May 26 and opened June 29, at which time the Elliott Co of Jeanette, Pa., submitted the lowest bids for the generators (EW, June 20, p. 56).

Amounts of the first bids and the re-advertised bids for supplying three and four generators by four manufacturers — Elliott Co, Allis-Chalmers Mfg Co, Westinghouse Electric Corp and General Electric Co — are shown in the tabulations.

First Bids

	3 Gen.	4 Gen.
Elliott	$2,048,665	$2,691,925
A-C	2,244,655	2,963,540
Wstgh	2,285,850	3,017,800
GE	2,423,950	3,203,481

Re-Adv. Bids

	3 Gen.	4 Gen.
Elliott	$2,048,665	$2,691,925
A-C	1,965,320	2,595,000
Wstgh	2,008,000	2,638,090
GE	2,046,925	2,690,945

Cleveland to Install Fluorescent Street Lights

Clevelanders will have their first view of fluorescent street-lighting this September when a number of the luminaires will be energized on mainstem Euclid Ave. Switching-on of the lights will be in conjunction with the national convention of the Illuminating Engineering Society, September 12-17 in Cleveland.

The entire lighting installation, costing $55,000, will be along both sides of Euclid Ave from Public Square east to E. 22nd St, a distance of a little over a mile. This section is Cleveland's downtown shopping area.

A total of 128 units will be installed atop present poles, with extensions being added to adjust the lights out over the street. The units (each tube is about 7 ft long) will hang 30 ft above the street, and will be spaced at 90-ft intervals, opposite each other. The lights will be mounted horizontally at first, but will be set so that they can be deflected at different angles.

The new lights are estimated to triple the lumens now shed on downtown Euclid Ave. Present lights yield 0.8 candle power per sq ft at street level. The fluorescent lamps are being supplied by Westinghouse Electric Corp.

Installation will begin early in August. City officials hope to have at least one block of lights ready to be turned on for the IES meeting. Completion of the project now is scheduled for late September or early October. Previous plans called for the entire installation to be switched on during the IES meeting, but deliveries of the metal extensions and base plates have been slower than expected.

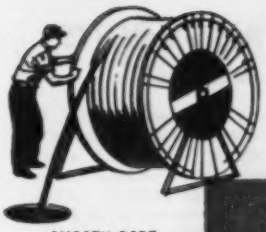
Cleveland's Euclid Ave Merchant's Association, which has urged the city for a long time to put in fluorescent lights, is planning a street festival to coincide with the turning on of the lights.

GE Awarded Contract for Autotransformers

General Electric Co's offer of $1,253,403 for six 345-kv autotransformers for the Chief Joseph-Covington section transmission line tops current (June 24) contract awards by Bonneville Power Administration. Offer was for invitation 7616 in a group of awards representing BPA's accelerated construction program. Included was an award for $76,402 to Witzig Construction Co., Corvallis, Ore., for construction schedule II, Reston-McKinley 230-kv transmission line, and an award to Westinghouse Electric on a $70,894 offer for mobile power transformers. BPA announced General Electric was low at $63,326 for other mobile power transformers for which bids were opened June 24.

Meanwhile, the Corps of Engineers announced Acec Electric Corp., New York City, representing Charleror, Belgium manufacturer, appeared low among eight bidders with an offer of $203,496 for design, manufacture and delivery of two 3,750 kva station service generators and appurtenances

(*Continued on page* 182)



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NO SCORING OR
ABRASION OF SHEATH

EASY TO
INSTALL

EASY TO TOOL

The Happy Combination

CUTS WITH SAW

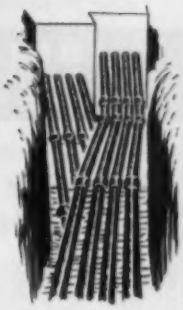
LIGHT - EASY
TO HANDLE

Complete Protection...
Long Life...Low Cost

ORANGEBURG
NOCRETE

COMPLETE LINE OF
INTERLOCKING PLASTIC SPACERS

WATER TIGHT JOINTS



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STANDARD

HOW does Orangeburg give cables complete protection? It's tough and strong. It's resilient, and "gives" without cracking or breaking. Its walls are impermeable. Its non-metallic material resists acids, alkalies, oil and salt in ground waters. Its joints are watertight. Its smooth bore reduces danger of abrasion.

WHY such low cost? Because Orangeburg is lightweight and easy to install; it lays faster than any other type of conduit... saves time and money. The long 8-foot lengths mean fewer joints to make. The Taper Sleeve Joints seal watertight with a few light taps. It lasts indefinitely... gives years and years of economical service.

Orangeburg is a leader in every city and state. For data about Fittings, Angle Couplings and Bend Sections, write Dept. EW-75A.

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FIBRE CONDUIT

STANDARD INSTALLED WITH CONCRETE

NOCRETE INSTALLED WITHOUT CONCRETE

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ELECTRIC COMPANY

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BRANCHES AND STOCKS IN PRINCIPAL CITIES

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Crapo

Guy and Messenger Strand

IN THE FIELD as in laboratory tests . . . *Crapo* Galvanized Steel Strand proves itself capable of withstanding severe punishment. Steel's inherent strength and durability are combined with definite economies in every size and grade of *Crapo* Steel Strand. You'll find the heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Contact your jobber of *Crapo* Galvanized Products or write direct for further information!

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Greater Safety and Efficiency

TRIP POLE TONGS

A sturdy efficient tool designed for handling poles, piling and timber, made of high tensile steel; opened by trip line. Compression on object is 38% of its weight.

TWO SIZES

11½" opening. 16½" opening.

Write for Catalog

HOGG & DAVIS

2590 East 67th Street
Long Beach California

GE Autotransformers

(*Continued from page* 180)

for The Dalles Dam on the Columbia River. Four bidders were foreign for the equipment for which shipment must be completed by Dec. 1, 1956. Other bidders were: Westinghouse Corp., $240,254; Allis-Chalmers Mfg. Co., $252,130; Electric Machinery Mfg. Co., $224,319; Schorch-Werke, Rheydt, Germany, $277,140; American Elin Corp., New York (Weiz, Austria), $224,370; General Electric Co., $236,292; and English Electric Export & Trading Co., New York, $271,713.

Cope Develops Ladder for Armored Cable

A cable ladder and a channel for supporting armored cable have been developed by T. J. Cope, Inc., of Philadelphia, Pa. These items are additions to the company's line of prefabricated expanded metal troughs. The new supports will be available for shipment in approximately five or six weeks.

The ladder consists of Z-shaped stringers with rungs to which the cable can be attached for main runs. The channel is punched for ventilation and drainage, and is used for branch runs. Both the ladder and channel have pin-type couplers.

Pin-type couplers are now standard components on Cope's cable trough systems. The coupling is said to reduce field assembly time of troughs by 80%. This type has interlocking barrels which are factory-welded to the trough sections and fittings. A pin is driven into the interlocking barrels thus locking the parts together. For a trough coupling only three parts are needed in comparison to the former 26 pieces for 6-in. troughs and up to 50 pieces for 24-in. troughs.

Pickens Plans New Plant

Pickens Electric Mfg Co, a division of the Sangamo Electric Co of Springfield, Ill., plans to build a 100,000 sq-ft plant at Pickens, S. C., for the manufacture of electrolytic capacitors. These electronic devices are presently being made at Sangamo's Marion, Ill., plant.

SALES ASSIGNMENTS

Company Staffs

Allis-Chalmers Manufacturing Co has created a Columbus, Ohio, sales district headed by Walter B. Lawrence, a sales representative in the Cincinnati district office since 1943. In addition, A-C has assigned R. H. Barnes and D. T. Fowler as sales representatives to the Cleveland and Evansville offices, respectively, and J. J. Dwyer as field service representative in the mid-Atlantic region with headquarters in Haverford, Pa. These three men recently completed the company's training course for graduate engineers.

Gould-National Batteries, Inc, has appointed Richard Relf as Cleveland district manager. He has been employed in Gould's Chicago and Columbus districts.

Minnesota Mining & Manufacturing Co has promoted Frank J. McGuinn from sales manager of insulation products to division sales manager of electrical products in the New York branch.

Joseph T. Ryerson & Son, Inc, has assigned Homer R. Brown to the new post of sales manager of the Milwaukee steel service plant. In addition to his new administrative responsibilities Brown retains a small group of accounts in the Milwaukee area. He has been a sales representative there since 1930.

Westinghouse Electric Corp has announced the following assignments: Edward D. Lynch, Jr, Hartford, Conn., sales engineer, has been named Buffalo area sales manager to succeed Paul B. Shiring who has joined the northeastern region staff headquarters in New York City; William B. Cone has been promoted from sales engineer in Bridgeport, Conn., to Albany area sales manager; I. W. Morrison has been appointed acting manager of the Lamp Division's Connecticut district to succeed F. R. West who is on sick leave; and named to new posts as district managers of portable appliances are N. H. Davis in St. Louis and J. A. MacMorris in Cleveland.

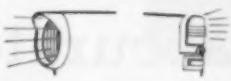
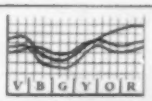
Representatives

J. F. Pritchard & Co has appointed Factory Sales & Engineering, Inc, as sales representative for southern half of Louisiana and southern two-thirds of Mississippi.

Arkansas P&L Cited

Arkansas Power & Light Co has won the Research Institute of America's Award for Merit for achievements in company operations. The award cited AP&L's "contribution to development of executive skills and in human relations and manpower utilization" through the utility's "division-level" managers' conferences held for the first time this year.

IT ALL ADDS UP:

	Fleur-o-lier certification
	RLM certification
	CBM certification
	CSM certification
	CLM certification
	Automotive exterior lighting and safety glass tested to S.A.E. specifications
	Testing and inspection for lamp quality
	Lamps supplied, standardized for lumens, color temperature, candlepower, and electrical values
	Color measurement — visible spectrum — reflectance, transmittance, light sources, photocells
	UV, infrared — invisible spectrum — spectral energy response of filters, photocells and test plates
	Calibration, standardization and spectral response of light meters, photocells, test plates

ETL *IT ALL ADDS UP:*

A constructive contribution to the lamp and lighting industry through independent test reports backed by 59 years of service to the industry.

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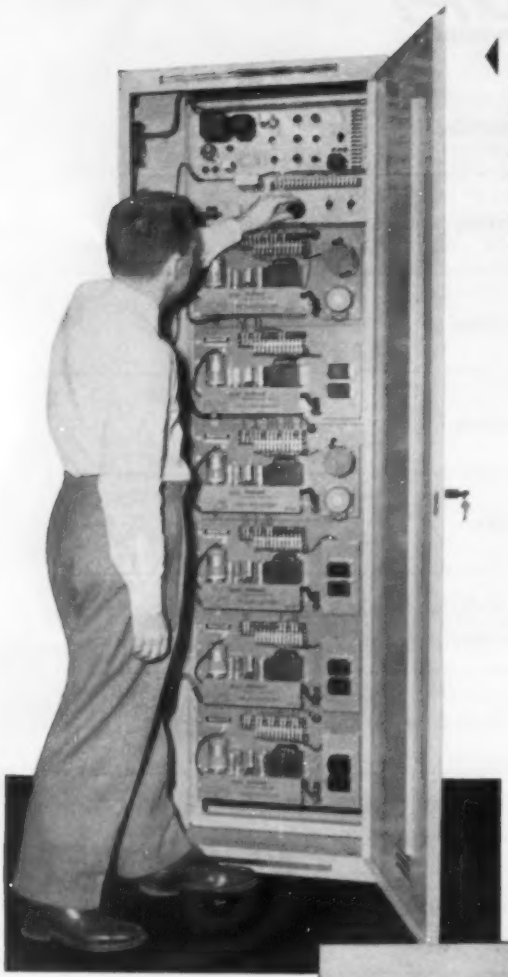


CONTROL SERVOS *employ true feedback circuits for absolute stability of operations. They are mounted, with their power units, in hinged racks that permit easy inspection. Speed of response is readily adjusted to match individual turbine governor motor characteristics.*

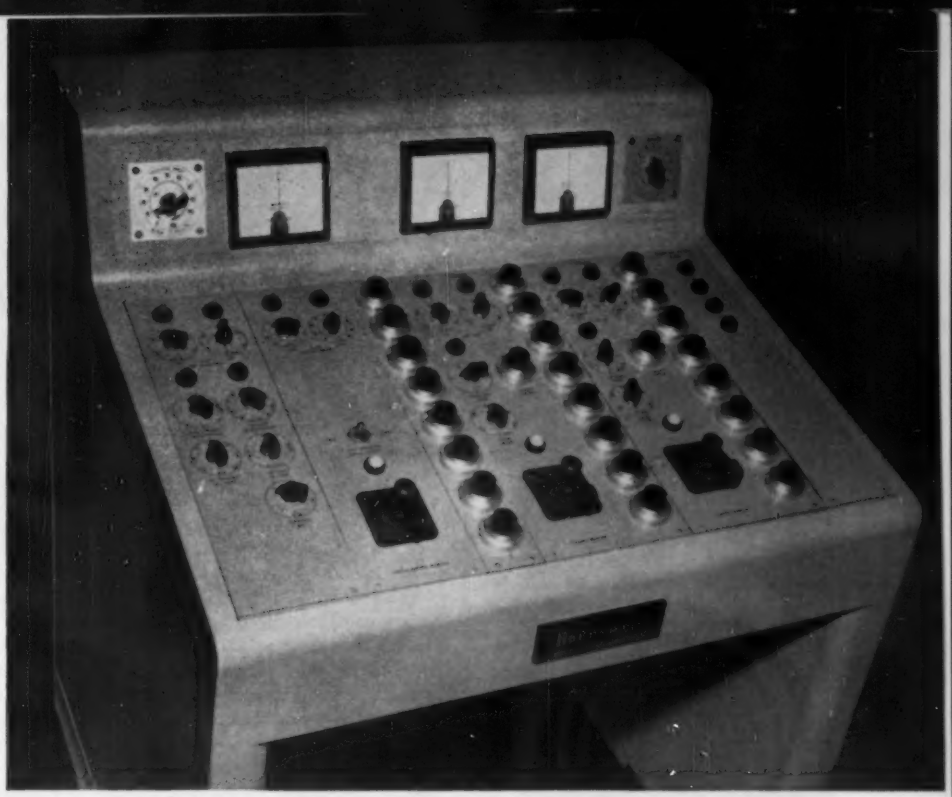
NEW!

fast, accurate, all-electronic

HIGH SPEED TELEMETERING *operates through any type of channel—wire, carrier or microwave. Pulse rate system provides high accuracy unaffected by changes in gain or distortion in the intervening channel. Fast, continuous measurements faithfully follow each fluctuation in load. All vital data are displayed on wide, readable instrument records on the dispatcher's instrument panel.*

CUSTOM-DESIGNED CONTROL CONSOLES

like this one place complete, flexible control at the operator's fingertips. He can set low and high limits . . . schedules . . . choose fringe or fringe plus sustained control action. He can take over on manual control in an instant. On station control consoles, he can set up incremental loading schedules for individual generators, based on cost loading curves. Literally unlimited variations are possible, depending on the requirements of the particular installation.



load and frequency control

engineered and built by Honeywell for regulating

- network interchange
- system load dispatching
- generation of individual units

MAXIMUM ECONOMIES of system operation can be achieved, and generation and interchange schedules accurately maintained, by the use of Honeywell Load and Frequency Control. Completely electronic, this control uses highly stable, dependable servo circuits. New standards of precision and speed . . . plus exceptional flexibility built into the control equipment . . . give the operator fingertip control over load distribution between stations, between individual generators in each station, and between his system and interconnections.

The Honeywell control equipment includes continuous, high-speed telemetering, using pulse rate transmission that is unaffected by channel fading or distortion. Area and net power measurements are automatically added algebraically by electronic totalizing circuits.

Individual control consoles for system or station operators are custom-engineered. They incorporate simplified means for setting up and automatically maintaining incremental loading schedules based on various generation efficiencies. System control can be flat frequency, flat tie line, or tie line bias . . . whichever the dispatcher prefers for any area.

The entire equipment is designed for economy in first cost and in maintenance. "Building block" design simplifies the initial installation and makes expansion easy. Fewer control signal channels are required . . . usually only a single transmission channel for each station.

Your local Honeywell sales engineer will be glad to discuss the requirements of your specific utility. Call him today . . . he's as near as your phone.

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● **REFERENCE DATA: Write for new Bulletin 9060, "Honeywell System Load and Frequency Control."**

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

First in Controls

W. T. LUCKING (top) C. TITUS (bottom)

Arizona Public Service Ups Lucking and Titus

Vice President Walter T. Lucking has been elected president and a director of Arizona Public Service Co, following the resignation of Henry B. Sargent, president and general manager of the utility (EW, July 4, p 9). Claire Titus has been elected a vice president. He continues as assistant to the president of Public Service.

A mechanical engineering graduate of the University of Colorado, the new president began his utility career 20 years ago as a design draftsman with Public Service Co of Colorado. Within a year Lucking joined Cities Service Co of Denver, Colo., and completed an engineering training course. During the next eight years he worked in various capacities with Cities Service and some of its subsidiary companies.

Lucking then went to Arizona Edison Co as assistant to the president. After six months he was elected vice president with responsibility for personnel, budgets, rates, publicity, sales, and safety. Following the 1952 merger of Edison with Central Arizona Light & Power Co, he became general superintendent of power supply for the new company, Arizona Public Service. Last year he was named vice president in charge of operations.

Titus, a graduate of Polytechnic College of Engineering, Oakland, Calif., has spent 18 years in the utility industry and allied fields. He has been associated with Idaho Power Co, United States Bureau of Reclamation, Cascade Machinery Co, and Pacific Gas & Electric Co.

Titus joined Public Service in 1950 as a sales consultant, and became commercial and industrial sales manager the next year. He was appointed assistant to the vice president in 1953 and was named assistant to the president of the Arizona utility in 1954.

Two New Jersey Utilities Announce Executive Changes

C. E. KOHLHEPP

Charles E. Kohlhepp, president of Jersey Central Power & Light Co, has also become president and a director of New Jersey Power & Light Co (EW, July 11, p 78). Both companies are subsidiaries of General Public Utilities Corp.

Kohlhepp succeeds Hugh C. Thuerk, who remains at New Jersey P&L as executive vice president and a director. Thuerk also has been elected a vice president and director of Jersey Central P&L.

Kohlhepp had been associated with Wisconsin Public Service Corp since 1920. This past April he resigned as president to become head of Jersey Central P&L.

Thuerk headed sales and public relations of Atlantic Utility Service Corp, was president of Bradford Electric Co, Bradford, Pa., and in 1943 became president of New Jersey P&L.

H. C. THUERK

O.Z. pull boxes

SAVE TIME! SAVE SPACE! SAVE MONEY!

The easiest, most economical way to speed installation of conduit—of any size from ½" to 6"—is to use O. Z. Pull Boxes. Two hot dip galvanized malleable iron units fitted to an oversize length of pipe replace the conventional, bulky and costly pull box . . . cuts labor time in half!

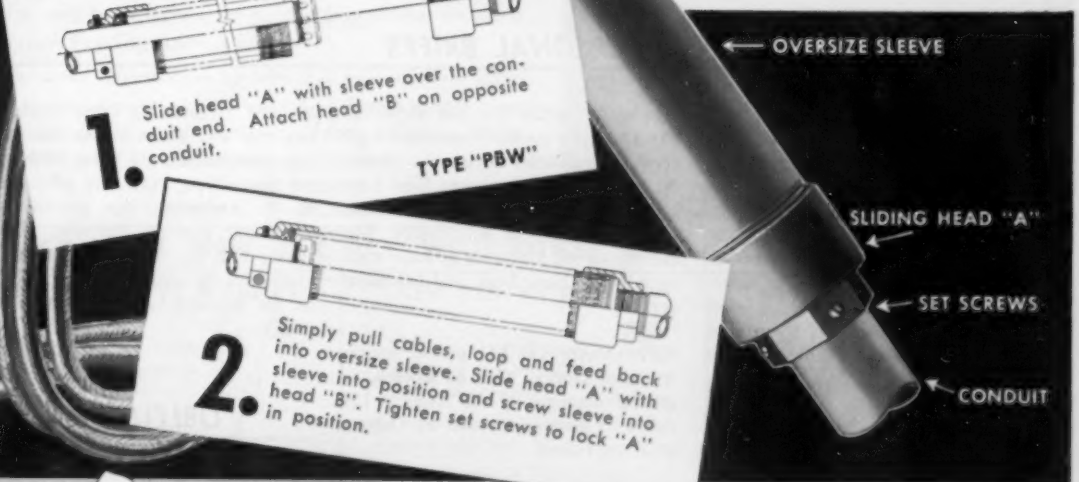
O. Z. Pull Boxes are available in four designs: standard (Type "PB"); weather-tight (Type "PBW"); explosion proof and thin wall conduit. The oversize sleeve can be cut to required length "on the job" from standard conduit, or furnished to your specifications by O. Z.

Call your local O. Z. distributor, or write direct to the company for complete information.

1. Slide head "A" with sleeve over the conduit end. Attach head "B" on opposite conduit.

TYPE "PBW"

2. Simply pull cables, loop and feed back into oversize sleeve. Slide head "A" with sleeve into position and screw sleeve into head "B". Tighten set screws to lock "A" in position.



O.Z. ELECTRICAL MANUFACTURING CO., INC.

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San Francisco Plant: 501 Indiana Street, MArket 1-4709

CAST IRON BOXES
CABLE TERMINATORS
POWER CONNECTORS
SOLDERLESS CONNECTORS
GROUNDING DEVICES
CONDUIT FITTINGS

C. H. WEAVER

Westinghouse Elects Weaver Atomic VP

Westinghouse Electric Corp has elected Charles H. Weaver vice president in charge of atomic power activities. He has directed the Atomic Power Division since its organization in 1948.

John W. Simpson, Westinghouse manager of the reactor project for Duquesne Light Co's Shippingport atomic power station, has been advanced to the post of manager of atomic reactor development.

Weaver entered Westinghouse's graduate student training course in 1936 after receiving a degree in electrical engineering from the University of Pennsylvania. During World War II he served as manager of marine sales and was later made central district industrial manager. He served in that capacity until his 1948 assignment to direct the Atomic Power Division.

Tuttle Becomes Crouse-Hinds President

John R. Tuttle, vice president and treasurer of Crouse-Hinds Co since 1951, has been elected president and board chairman of the Syracuse, N. Y., manufacturer. At the same time, announcement was made of the retirement of William L. Hinds, chairman, Albert F. Hills, president, and W. C. Blanding, executive vice president. They will continue as directors.

Tuttle was graduated from Yale University in 1913 and later received a master's degree in electrical engineering from Harvard University. Following employment with a railroad and an electric utility he joined Brown-Lipe-Chapin Co in 1917 as a research engineer. He resigned as controller to accept that post with Crouse-Hinds in 1933. Tuttle was named secretary and a director in 1943.

J. R. TUTTLE

PERSONAL BRIEFS

Pittsburgh Reflector Co has named **Eric D. Altree** head of its new Luma-Ceiling and Church Lighting Equipment Division. **Harold D. Siler** of the Pittsburgh sales staff succeeds Altree as manager of the engineering department . . . **Thomas E. Williams,** in addition to his present duties as superintendent of the Los Angeles steel service plant of Joseph T. Ryerson & Son, Inc, has been appointed general superintendent of the company's West Coast plants.

Dr. Lawrence R. Hafstad, director of the Atomic Energy Division of Chase Manhattan Bank, will join General Motors Corp as director of its research staff later this year . . . H. Zinder & Associates, Inc, utility consultants, has announced that **Earl Trager,** former senior geologist with the Federal Power Commission, has joined the firm as chief geologist.

Kuhlman Electric Co has appointed **Jay G. Gates** southern sales manager for its Transformer Division . . . **Harry A. Ronan** has been named New England regional manager for Motorola Communications & Electronics, Inc. He has served Motorola as zone manager in the New York and Michigan areas.

White Motor Co has named its director of service, **Karl A. Roesch,** as general manager of the Autocar Division to succeed **Edward F. Coogan** who has retired.

Lester W. Evers, assistant to the plant manager of Hubbard & Co's Chicago operations, has been appointed an assistant vice president . . . Brown Co has promoted **Arthur R. Taylor** from production manager of its Upper Plants to general manager of Bermico Division . . . **E. H. Krieg,** a Stone & Webster Engineering Corp consulting engineer and steam power specialist, has been transferred from Boston to the firm's New York City offices . . . **R. E. Anderson,** vice president of Delta-Star Electric Division, H. K. Porter Co, Inc, has retired after 35 years with the company. He continues in an advisory and consulting capacity.

OBITUARY

Richard H. Jones, 66, died June 29 at Salt Lake City, Utah. Vice president and treasurer of Utah Power & Light Co since 1944, Jones had been with the company 42 years.

Arthur E. Ormsby, 53, manager of the Calgary, Alberta, district of Canadian General Electric Co, died June 28.

. . . another advance in mercury lighting from G. E.

Now 54% more light from G-E 400-watt mercury lamp

New General Electric H400-RC1 gives top color balance, too

In another mercury lighting first, General Electric has raised the light output of the H400-RC1 mercury lamp from 12,300 to 19,000 lumens! This 54% increase in efficiency results from using a special fluorescent phosphor as a reflector as well as to improve color balance. Its color characteristics are best of any mercury lamp for general lighting. Color rendition approximates a mixture of ⅓ filament light and ⅔ mercury light.

The new G-E H400-RC1 mercury lamp has a life rating of 6000 hours at 5 or more hours per start. It operates on the same equipment as all other 400-watt mercury lamps and is interchangeable in most reflectors.

With its controlled beam, good color, easy maintenance, and high light output, it is first choice for most mercury lighting applications.

For more information on how this new mercury lamp can fit your operation, call your G-E Lamp supplier, or write General Electric Company, Lamp Division, Dept. 482- EW7, Nela Park, Cleveland 12, Ohio.

COMPARE NEW G-E RC1 WITH OTHER 400-WATT MERCURY TYPES

NEW RC1 VS H400-E1

- Light on the work equal or greater in most equipment
- Adds color balance
- Less maintenance

NEW RC1 VS H400-J1

- Delivers 10-20% more light on the work in most equipment
- Has somewhat better color balance
- Lower cost of light

NEW RC1 VS H400-A1

- 35% more light on the work in most equipment
- Has good color balance
- Lower cost of light

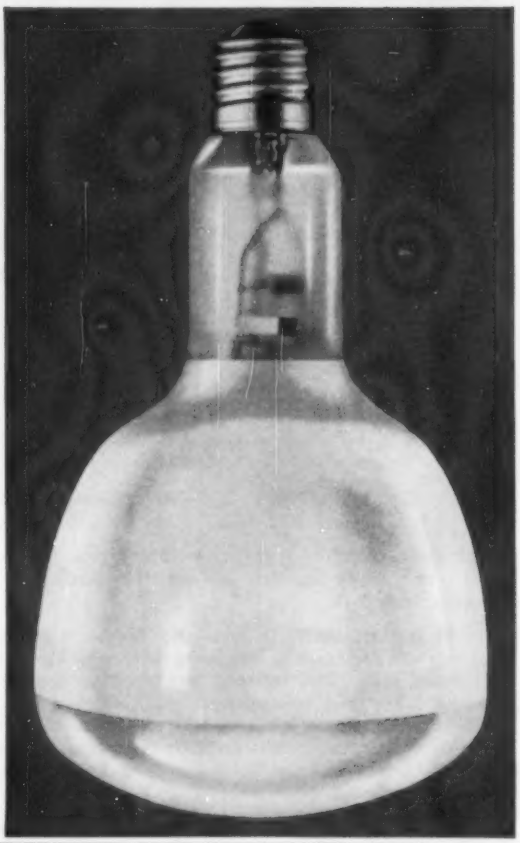
Progress Is Our Most Important Product

GENERAL ELECTRIC

. . . another advance in mercury lighting from G. E.

Now 54% more light from G-E 400-watt mercury lamp

New General Electric H400-RC1 gives top color balance, too



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- Has somewhat better color balance
- Lower cost of light

NEW RC1 VS H400-A1

- 35% more light on the work in most equipment
- Has good color balance
- Lower cost of light

Progress Is Our Most Important Product

GENERAL ELECTRIC

new...

the most advanced achievement in fifty-seven years of lighting research... the incomparable

PARADOME*

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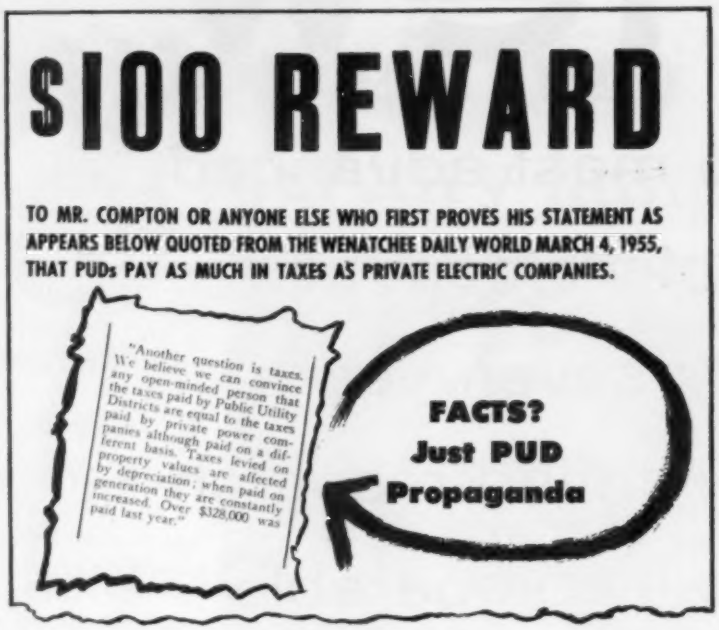
$100 REWARD
TO MR. COMPTON OR ANYONE ELSE WHO FIRST PROVES HIS STATEMENT AS APPEARS BELOW QUOTED FROM THE WENATCHEE DAILY WORLD MARCH 4, 1955, THAT PUDs PAY AS MUCH IN TAXES AS PRIVATE ELECTRIC COMPANIES.
"Another question is taxes. We believe we can convince any open-minded person that the taxes paid by Public Utility Districts are equal to the taxes paid by private power companies although paid on a different basis. Taxes levied on property values are affected by depreciation; when paid on generation they are constantly increased. Over $328,000 was paid last year."
FACTS? Just PUD Propaganda

WWP Spikes PUD Tax Claim

Company ad challenging PUD official's statement draws surprising public response and many requests for literature

When Chelan County (Wash.) Public Utilities District Commissioner Ivan J. Compton was quoted recently in a local newspaper as telling a Republican club meeting that PUDs paid as much taxes as private utilities, Washington Water Power Co knew it had trapped the commissioner.

Compton had said: "We believe we can convince any open-minded person that the taxes paid by PUDs are equal to the taxes paid by private companies although paid on a different basis."

To this WWP replied with a quarter-page ad in four Chelan county newspapers. Under the bold headline "$100 Reward," the ad offered to pay this amount to anyone who could prove the statement by Compton.

Randall Johnson, WWP advertising manager, wrote the ad, quoting four sources to disprove Compton's assertion. The ad maintained, on authority of the sources, that private utilities pay 22% of each revenue dollar in taxes while PUDs pay about 5.6%.

"As a sort of an afterthought," Johnson said, he boxed in a coupon in a corner of the ad, to give readers a chance to write to WWP for literature on this subject.

Then, "hoping we hadn't overlooked some minor technicality of the tax laws," WWP sat back and waited. A trickle of coupons began, then a flood, and after several hundred requests for literature, WWP had to publish a second ad announcing a temporary exhaustion of its supply of literature.

"We had some more printed and sent out," says Johnson. But even today each mail brings one or two coupons. The results of the ad far exceeded anything the company anticipated. There has been no public challenge of WWP's ad.

Johnson recalls that after he drew the original draft advertisement and showed it to the public relations and advertising department head, Kimball I. Jack, it appeared that some delay might result while they waited for the company's legal department to approve the content.

Jack laid the ad before WWP Pres Kinsey M. Robinson, who took one look and swept away any hesitancy. Said Robinson, "Run it!"

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Donald Beeman, *Editor*

Manager, Industrial Power Engineering, Industrial Engineering Section, General Electric Company, Schenectady, New York

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AIEE MEETING REPORT

(*Continued from page* 88)

solidated Edison. A series of tests established time-current curves as a guide to loading and protection for several insulation temperature limits. Reasonable approximation of test data by mathematical calculation of the thermal circuit was claimed by R. H. Kolks, Cincinnati G&E. This method permits evaluation of variables beyond the scope of experimental procedures.

Limiters Provide Protection . . . Limiters must be (1) fast enough to prevent destruction of insulation on network cables carrying fault current, and (2) slow enough to coordinate with network protector fuses, said C. P. Xenis, also of Con Ed. Characteristics proposed for limiters protect cables over a wide range of short-circuit currents but not for low values. But years of operating experience have demonstrated protection, he said.

Standard limiters are already available to prevent roasting of RH-RW insulation on many sizes of cable, said Fred Heller and Irving Matthysse, Burndy Engineering.

A high degree of protection is available for most networks, concluded E. L. Leinback, Detroit Edison, and A. S. Brookes, Public Service E&G. But protective devices must be evaluated and coordinated to achieve best results. The Class L 260 limiter will clear RH-RW network cable before insulation damage except where actual fault currents are low, they continued. Older types of cable insulation are less adequately protected, but experimental work shows that a corresponding Class L 220 limiter can be produced, they said.

Surge Attenuation Less on HV Cable

- **Field test findings show attenuation less on 40-69 kv than at lower voltages**
- **Find connected lines cannot reduce surge voltages enough to make 24-kv sub-station self-protecting without arresters**

Today's trend to underground circuits in urban areas is focusing increased attention on surge protection for equipment connected to overhead lines through cables. In some cases, cable impulse characteristics will permit economies through use of reduced insulation or fewer lightning arresters. In others, arresters can be omitted.

Surge attenuation in power cables bears on this trend and was the subject of a field study on the Potomac Electric Power Co system, reported by W. W. Valentine of PEPCO, and J. K. Dillard and J. M. Clayton of Westinghouse. Measurements over a two year period were made on 15, 40 and 69-kv class cables ranging from 2,000 to 32,000 ft long. Findings were: That wave-tail of the surge has a significant and wave-front a minor effect on attenuation; that attenuation is less on higher voltage cables (40 and 69 kv) than on lower voltage, apparently due to the higher shunt resistance and lower series resistance.

Field and laboratory studies of the effect that multiple lines have on surge voltage at the bus and connected transformer of a 24-kv substation were reported by H. R. Armstrong of Detroit Edison, and R. W. Ferguson and A. R. Hileman of Westinghouse. They found that connected lines cannot reduce surge voltages enough to make the station inherently self-protecting without arresters. Even with nine lines connected, surge voltage at the transformer was more severe than the insulation strength of a 150-kv BIL transformer. For stations with shielded overhead lines and only one 20-kv line-type arrester, two or more lines are necessary to provide adequate equipment protection.

They found the ratio of line to equipment BIL much higher in low than in high-voltage systems. So, with no arrester, surge voltages in per unit of equipment BIL are higher in low voltage stations. Moreover, although low voltage stations are compact and have high values of capacitance to ground, the high BIL of modern woodpole lines permits high surge voltages to enter the station, it was found.

A subcommittee of the Protective Devices Committee concluded from a survey of 45 utilities that little trouble has been associated with current-limiting reactors; and, that cable faults, apparently accompanied by transient over-voltages, have been responsible for what little trouble there has been.

(*Continued on page* 200)

Left — Heavy, felted asbestos walls are applied over and under the varnished cambric tapes . . . then thoroughly impregnated . . . *Right* — then the impregnated asbestos is compressed to a dense, homogeneous wall that ensures long cable life.

look beneath the braid

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OFFICIAL PROPOSALS

Bids: August 9, 1955

Power Authority of the State of New York

ST. LAWRENCE POWER PROJECT
ADVERTISEMENT FOR PROPOSALS
FOR
THE FURNISHING AND DELIVERY OF 15 KV METALCLAD SWITCHGEAR AND APPURTENANCES

SPECIFICATIONS NO. PA-5-14025

ST. LAWRENCE CONTRACT NO. P18

NOTICE TO CONTRACTORS: The POWER AUTHORITY OF THE STATE OF YORK wil receive sealed proposals for the design, manufacture and furnishing of 15 kv Metalclad Switchgear and Appurtenances and delivery thereof, f. o. b. the Authority's classification yard, Massena, New York, as follows:

(1) If brought in person on the day of receiving bids until 10:30 A. M. Eastern Daylight Saving Time on the 9th day of August 1955, 270 Broadway, Hearing Room C on the sixth floor, New York, New York.

(2) If mailed in until 10:15 A. M. Eastern Daylight Saving Time on the 9th day of August 1955, at the Authority's office, 270 Broadway, Room 1300, New York 7, New York.

The proposals will be publicly opened and read aloud at the time and at the address given in (1) above. Bids will be entertained for the 15 kv Metalclad Switchgear, associated equipment and services in accordance with the bidding schedule. Erection at the site of installation will be done by others but services of erecting engineers shall be provided by the manufacturers if and when required. Delivery of the 15 kv Switchgear and Appurtenances, will be required by September 1, 1957.

Plans, Specifications and Proposal Forms for the work will be on file in the Authority's office and in the offices of the Engineer, Uhl, Hall & Rich, 230 Congress Street, Boston 10, Massachusetts, and the Hydro-Electric Power Commission of Ontario, 620 University Avenue, Toronto 2, Ontario, may be inspected by prospective bidders during office hours, and may be obtained from the Power Authority of the State of New York, 270 Broadway, Room 1300, New York 7, New York, upon application and prepayment of a fee of Ten ($10.00) dollars per initial set of contract documents and Five ($5.00) dollars per set for additional sets, no part of which will be refunded. Two sets must be returned with each bid.

Bids will not be restricted to American manufacturers.

Bids must be made in duplicate upon the proposal forms included in and bound with the Contract Documents. Bid deposit will be required with each bid in an amount not less than 10 per cent of the gross sum bid for the schedule.

The right is reserved to reject any or all bids.

W. S. CHAPIN
GENERAL MANAGER

7/8/55

DIESEL POWER

IMMEDIATE SHIPMENT
• PURCHASE OR RENTAL
UNIT CAPACITIES—10 TO 2475 KVA
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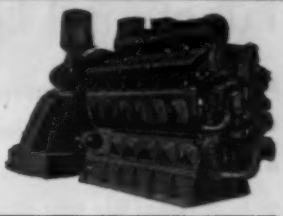

A PARTIAL LISTING OF OUR INVENTORY

KW	MAKE	Model	HP	RPM	KW	Make	Model	HP	RPM
1180	Worthington	8EH-6	1585	360	220	Superior	6GB-6	460	450
1136	Fairbanks Morse	38D	1600	720	200	Fairbanks Morse	32E14	450	300
1100	General Motors	16-278A	1600	720	300	General Motors	8-268A	450	1200
1000	General Motors	16-567B	1440	720	250	Clark	GD-6	375	360
750	General Motors	12-567	1080	720	200	General Motors	8-268A	350	900
700	Worthington	EE-6	1000	327	175	General Motors	12-71	275	1800
675	Fairbanks Morse	38D	960	720	150	Buckeye	80	240	600
500	General Motors	8-567	720	720	148	Fairbanks Morse	32E14	220	300
500	Alco	6-12 11x13T	750	600	100	General Motors	3-268A	150	1200
350	Baldwin	VO-6	510	450	60	General Motors	6-71	90	1200
320	Enterprise	DBG-6	460	450					

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FOR SALE

3—1000 Kva Mol. 11500-2400/4160Y
3— 500 Kva G-E 22000-2300/4000Y
5— 333 KVA W-H 38000-7200/12470Y
3— 333 KVA G-E 33000-2300/4000Y/6900/11950Y
3— 333 Kva Wagner 6900/11950Y-7200/12470Y
3— 250 Kva G-E 2415/2300-600
6— 200 KVA G-E 13200-2400/2300
6— 200 KVA G-E 13200-230/460
3— 167 KVA W-H 13200-2400/4160Y
3— 167 KVA Wagner 2400-600

Many other items in stock.

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
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Cincinnati 27, Ohio
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LARGE POWER EQUIPMENT

Do you receive our stock list? Prompt shipment from inventory. A.C. & D.C. Motors, Transformers, M-G Sets, Frequency Changers, Controls, Turbo-Generators and Circuit Breakers. Attractive prices for rebuilt-guaranteed equipment. Contact us before purchasing.

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51 Howell St. Jersey City 6, N. J.

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
3	1000	Mol.	110,000—460
1	10000	A.C.	66000—33000, 3 ph.
1	3750	West.	69000—14400, 3 ph.
4	2500	Mol.	66000—13200
4	750	G.E.	66000/114000—13200
4	500	West.	69000—6900
3	300	Pitts.	66000—2300
2	1500	Wag.	44000—6900
3	1250	A.C.	44000/11500—460
3	300	West.	44000—480
3	75	Est.	44000—7200/12470 Y
1	7500	A.C.	39838/69000 Y—13800, 3 ph.
1	5000	G.E.	38100/66000—6600
1	3750	Penns.	38030/65865 Y—13800, 3 ph.
4	3333	G.E.	38100/66000 Y—33000
4	3125	Mol.	39900/66000 Y—26600/46000 Y
6	2000	Mol.	38100/66000 Y—13800
9	3333	G.E.	33000/11000—2400/7200
1	3000	G.E.	33000—6900/2300, 3 ph.
2	3000	Stand.	33000—4160, 3 ph.
1	2000	Kuhl.	33000—6900, 3 ph.
4	333	G.E.	34500—13800/23900 Y
3	300	A.C.	34500—2400/7200/12470 Y
3	75	Wag.	33000—240/480
2	3750	G.E.	26400—4360/2520, 3 ph.
3	2000	G.E.	26400/13200—2400
3	1250	G.E.	26400/13200—2400
4	1500	A.C.	25400/44000 Y—6900/13800
4	450	A.C.	25410/44000 Y—13250/23000
3	333	G.E.	23800/13200—2400
3	100	G.E.	23800—7200/12470 Y
1	667	A.C.	19653/33000 Y—2400/4160 Y
1	600	Stand.	13200—2300, 3 ph.
1	450	Penns.	13200—2400, 3 ph. ASKAREL
3	200	G.E.	13200—2400
4	500	Mol.	7200/12470 Y—2400/4160 Y
4	167	G.E.	7200/12470 Y—2400
3	125	A.C.	6900—2300
9	37½	G.E.	6900—230/460
2	100	G.P.	4800/2400—240/480
3	333	G.E.	2400/4160 Y—600
3	250	G.E.	2300/4000 Y—115/230
3	200	West.	2400—240/480
3	150	West.	2400—230/115
1	100	G.E.	2300—575, 3 ph.

ALSO: Frequency Changers Motor Generator Sets Syn. Condensers Oil Circuit Breakers Feeder Regulators, etc.

BREW, WOLTMAN & CO., INC.
52 Church St., New York 7, N. Y.

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3—250 KVA Maloney Type C
TRANSFORMERS
2400—120-240 volt.
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Send for new list to
EBASCO SERVICES INCORPORATED
APPARATUS EXCHANGE Two Rector St., New York 6, N. Y.

 (Continued from page 194)

Functional Life Tests a Growing Need

- New transformer insulations create need for faster life tests
- Test code for insulation life of dry transformers offered
- Tests demonstrate 4-year life for dry transformers at 150C
- Functional life test for oil-filled transformers also urged

Functional life testing of transformers is coming rapidly into the foreground as a basis for evaluating transformer insulating materials and systems. As new synthetic insulating materials have been introduced, it has been necessary to speed up the accumulation of service experience so new materials may be used with confidence sooner.

Evidence of this trend was seen in the presentation of a proposed code for functional temperature endurance tests of ventilated dry-type power and distribution transformers. The code does four things:

1. Establishes specifications for test samples, which may be either actual transformers or models.

2. Sets up a test procedure based on established principles of accelerated life testing. It consists of repeated cycles of elevated temperature, followed by exposure to high humidity and high potential till insulation failure occurs.

3. Gives methods of reporting and interpreting data.

4. Establishes a tentative criterion for determining the limiting temperature under rated-load conditions, for the system under tested.

In a related paper Paul Narbut, Westinghouse, member of the working group that drafted the code, reported on tests made to determine the practicability of the proposed code. Beyond showing that the procedure given in the proposed code is practical and will differentiate between structures built of different material, the tests show that mechanical shock may be an important factor in determining the life of dry-type transformers.

Results of final tests, presented by H. G. Zambell, Allis Chalmers, another member of the working group, supported these conclusions and went on to show by model tests that Group 2 dry-type power transformers have at least a four-year life at a continuous operating temperature of 150C when the code method of testing is followed. The study of models for use in evaluating the dry-type transformer insulation systems was reported in a conference paper by T. R. Walters and A. L. Scheidler, General Electric Co.

For Oil-Flled Types Too . . . Extension of functional life testing procedures to oil-filled distribution transformers was urged by A. M. Lockie, Westinghouse, as a step that would evaluate life of different designs on a given load cycle and of one design on various cycles. Lockie offered proposed test and analytical procedures to fill the need.

Concurring in general with Lockie was M. F. Beavers, General Electric, who described a model transformer unit for simulating tests on a full-scale liquid-filled transformer as proposed by Lockie. However, F. J. Vogel, Allis Chalmers, felt that since a distribution transformer is small the "whole animal" could be subjected to functional testing.

Dry-Type Pf Explained . . . Dry-type transformers inherently have higher power factors than liquid-immersed types. This G. A. Monito and L. B. Rademacher of Westinghouse attributed to the amount and location of insulation material used compared with oil-immersed units. The normal power factor of dry types has no effect on either the operation or the life of the transformer, he said. In most cases, minor irregularities are the cause of abnormally high power factors in dry-type transformers.

Saul Bennon and R. J. Cossart, Westinghouse Electric Corp, described the proper application of static plates in the design of inter-leaved, shell-form transformers. Static plates give the transformer designer a large measure of control over electrostatic voltage distribution. This control, he said, can be exercised over electrostatic surge transfer between windings as well as within windings.

Safety Problems Challenge Engineers

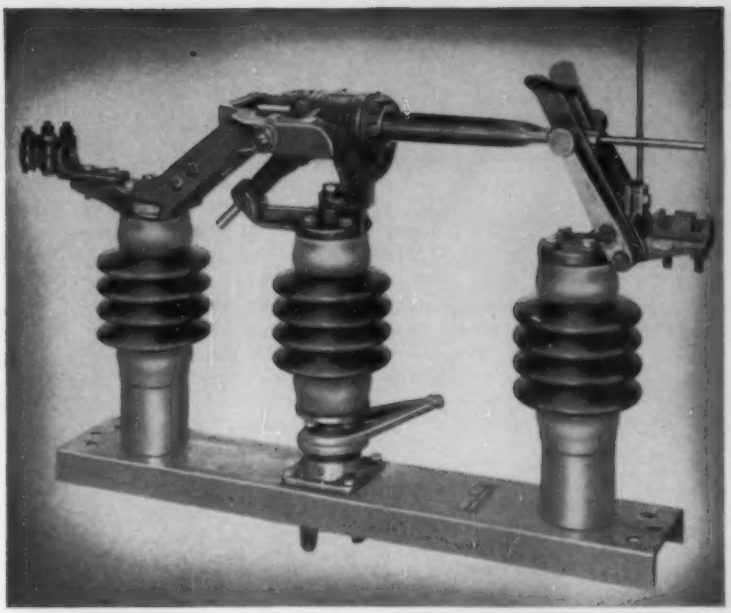
Engineering progress and watchful operation sustain the endless fight against electrical accidents. And progressive vigilance properly marked the session on safety.

R. L. Kline and J. B. Friauf, Bureau of Ships, U. S. Navy, said that in seven years, ending in 1952, 56 on-shore fatalities and 22 deaths afloat were traced to electric shocks to military personnel. Twelve of those on naval vessels were caused by circuits of 115 v or less, and eight involved portable electrical equipment. The steel hull of a ship and probable presence of salt water and perspiration create more hazardous electric shock conditions than are normally encountered in homes ashore.

They favored for the present using the grounded plug and receptacle system for portable tools, supplemented by periodic tests of insulation resistance and bimonthly checks of connections. The separately grounded system and the clip grounded system do not afford reliable protection primarily because the user of portable equipment does not take trouble to make the ground connection.

Fatalities from fires and accidents of electrical origin at Ontario Hydro totaled 152 from 1950 to 1954, according to E. W. McLeod, chief of the system's 145 electrical inspectors. Major categories were contact with high-voltage lines, contacts in industrial occupations, and dangerous conditions at home. Remedies specify more clearance between high-voltage conductors, metal structures and equipment, automatic grounding of non-current-carrying metal parts of portable electric tools, and the use of NEMA standard cap plug and receptables.

Work among rural customers is of vast importance. Grounding on the farm is being given wide attention, especially in regard to secondary neutrals including metal stanchions. Experience indicates that sustained voltages of 10 to 15 v will prevent livestock from drinking, and that potentials of from to 30 to 50 v are hazardous to animals.



NEW!

AF20 SWITCH

BY 3E

Vertical Break Switch with Rotating Blade

In this new 3E unit you'll find *all* the best in recent switchgear trends . . . *rotating switch* blade for easy action . . . *high pressure contacts at both ends* . . . heavy silver surfaces *at all contacts* . . . safety lock at both open and closed positions . . . and most important: the combination of these modern features with 3E's reputation for extra-heavy construction and sound design is a real guarantee for years of trouble-free service.

3E Rotating method makes operation unusually easy. In opening, the initial torque is concentrated on rotating the blade. This releases all contact pressure before the blade rises appreciably. Further operation raises the blade to full open position, and is remarkably easy because only the weight of the blade is concerned. This 3E feature eliminates a great deal of the usual abrasion of contacts and stress on the rest of the switch. Many engineers will find this design ideal where switches must be operated when heavily iced.

Ideal direct current path. The AF20 is designed for a minimum of contact points . . . and thus a minimum of possible trouble points. A hard-drawn copper blade nestles between identical contact systems at the front and hinge ends; so the current enters and leaves the switch under the same conditions. Contacts are hard-drawn copper bars with heavy silver inlays. Pressure is applied with strong low-stress coil springs.

Important construction and safety features. The smooth action is enhanced by careful selection of vital bearings. The blade rotates in a sealed Oilite bearing unit. A roller bearing is used at the top of the rotating insulator stack and a permanently lubricated, sealed ball bearing at the bottom. The blade locks in both open and closed positions and is over 90° from the contacts when open.

Front contact. Highly flexible system with silver inlays gives ideal contact plus long wear.

Hinge end view. Note rugged construction and 3E's strong, simple blade assembly.

FOR FULL DETAILS WRITE FOR BULLETIN 333

ELECTRICAL ENGINEERS EQUIPMENT CO., MELROSE PARK, ILLINOIS

READERS FORUM

Brazil Gets Largest Condensers Exported

To the Editor:

In the April 11, 1955 issue of Electrical World, p 56, an article headed "Japan Gets Largest Condenser Exported" states the condenser is for 400,000 lb of steam and the largest ever built in this country for export. It is claimed the condenser will be fitted at the site with over 9,000 American-made brass tubes and will weigh 100,000 lb.

Two much larger condensers were exported in 1953 for a plant we built in Brazil. An article on our plant would be headed as above, and would read:

Two 643,700 lb of steam per hr condensers, largest ever built in this country for export, were shipped to Brazil, constituting the largest piece of equipment ever shipped below deck by the New York Port Authority. The heavy pieces were unloaded at the port of Santos and hauled by special trailer up a 2,500-ft embankment to the city of Sao Paulo, Brazil, where they were installed in the Piratininga Plant of the Sao Paulo Light & Power Co, Ltd. Each condenser serves a 100,000-kw turbine generator unit. A total of 26,700 American-made aluminum brass tubes were installed in the two condensers, each of which weighs 573,000 lb.

The Piratininga Plant, the largest steam-electric generating station in Brazil, was designed by Stone & Webster Engineering Corp. Construction was done by Stone & Webster Construction Co.

T. A. Fearnside
Chief Mechanical Engineer

Stone & Webster Engineering Corp,
Boston, Mass.

● As we always say, "Use superlatives cautiously." Too often they "kick back."

Tesla and Westinghouse Cooperated

To the Editor:

One of the forgotten men of applied electrical science is Nikola Tesla. But for him, nobody knows how long we would have had to wait for polyphase electrical power transmission.

Biographers of Tesla tell us that he left little in the way of records and papers after his death and that he never made much in the way of drawings or specifications of his projected plans in electrical research. It was a surprise, therefore, to pick up a forgotten edition of an early book (1894) entitled "Inventions, Researches and Writings of Nikola Tesla," by James C. Martin, published by the "Electrical Engineer."

Today it is hard for us to realize that Tesla had such a tough time getting people to believe a motor could be made without rotor windings or commutator. It took a man of the caliber of George Westinghouse to appreciate it. He looked it over and wrote out a check for $1,000,000 for the manufacturing rights, with an additional royalty of one dollar per horsepower. That was his initial offer to Tesla—and it was accepted without any bargaining.

A very few years later Westinghouse was tied up in the 1892 depression and was refused further support by his banking firm unless Tesla released the company from further royalty payments. When Westinghouse visited Tesla and told him his predicament, Tesla said, "You treated me right when I offered you the patents on the polyphase motor, so I cannot do less than give you a full release at this time." Then he tore up the contract.

The advanced ideas entertained by Telsa are well illustrated by his suggestions to use the laminations of a motor for the capacitor plates for condenser-start designs.

Royal Lee,
President

Lee Engineering Co,
Milwaukee 3, Wis.

Farm Electrification Research Cited

To the Editor:

The editorial "Industry Research Should Be Coordinated" which appeared in the May 23 issue of Electrical World, prompts me to call attention to the Farm Electrification Research Report compiled by the Farm Group of the Commercial Division of EEI, of which I'm chairman.

This report, covering some 88 projects that electric companies have sponsored or contributed to, indicates the interest that our industry has expressed in farm electrification research. The report has been distributed throughout the industry, to cooperating land-grant colleges and universities, and to others interested in this field.

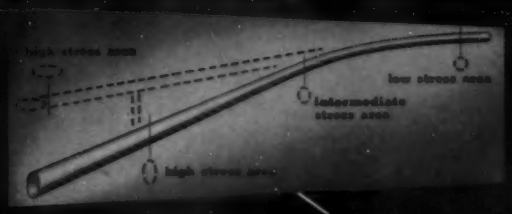
I would also like to call attention to the fact that electric companies have been interested in and have actively supported research in this field for many years. The Committee on Relations of Electricity to Agriculture (CREA), sponsored by electric companies, was organized in 1924 to promote and coordinate farm electrification research activities. This work continues in many states today. The Kansas and California CREA committees are typical examples. Even before 1924 companies were at work in rural electrification development.

Electric companies are continuing their support of research. The EEI Farm Group is planning to compile another report covering these activities in the near future. In the meantime we are carrying stories on these activities in the EEI Farm Electrification magazine and periodically mail information pertaining to research, sales and educational activities to electric companies throughout the United States.

The Farm Utilization Committee of EEI is assigned the task of keeping informed regarding new developments in farm electrification and making the information available to our industry.

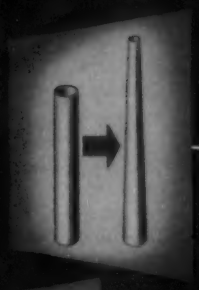
Bud S. Moss
Manager, Rural Division

Georgia Power Co,
Atlanta, Ga.



FIRST to provide ample strength in all-aluminum arms and arm-shaft joints through patented, seamless elliptical arms requiring no bracing for lengths up to 8 feet. On longer arms, one horizontally elliptical member, integrally welded to the arm, eliminates need for side-sway bracing.

FIRST to develop fabricating equipment and methods to permit use of high strength aluminum alloys.



FIRST to develop and produce seamless, tapered shafts from high-strength, extruded tubing in a wide range of diameters.

FIRST to pioneer the Aircomatic method of welding for fast, strong welds and negligible deterioration of alloy strength. All P & K welds are guaranteed . . . all P & K welding personnel and equipment is certified by U. S. Government agencies.

FIRST to stress use of castings of heat-treatable aluminum alloy, and first to introduce permanent mold castings for transformer bases, shoe and pedestal bases . . . with smooth surfaces and strong grain structure.

FIRST to eliminate unnecessary scrolls, tie-rods and other ornamental frills.

FIRST to design and build its own tapering machine to handle all diameters of extruded aluminum tubing.

Seven firsts . . . . . All are P&K

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WASHINGTON COMMENT

Congress Weighs Future TVA Financing

Three plans are in the hopper which would enable the agency to continue without federal funds for expansion, but Congress won't choose this year

The political battle over the Dixon-Yates contract is a surface symptom of a pressing problem: How to continue to meet growing power needs in the Tennessee Valley without increasing the load on taxpayers all over the country.

The private Dixon-Yates plant was one alternative offered by the Eisenhower Administration to provide a solution to this question. But ostensibly TVA supporters don't want private power to take the place of planned new TVA capacity. They've gone along with exchange contracts to bring private power into the system, but only when the source of that power lies well outside the limit of the TVA complex.

Is This a Precedent? . . . Memphis' decision to build its own plant to take the place of the Dixon-Yates plant is a stop gap. It does not solve the basic problem of how to continue to meet demands on TVA without more taxpayers' money even though it does point a way. Its worth as a precedent can only be determined as decisions are made.

The solution is in the hands of Congress. Congress now has before it three proposals whose backers see in each a way out of the woods:

- One would give TVA power to issue its own revenue bonds in order to obtain money for new steam plants. There would still be money appropriated to operate the agency, but new construction would be undertaken with funds obtained through bond issues. No one would have the power to veto TVA plans in this respect. The TVA board suggested this approach.
- An alternate to this proposal was submitted by Eisenhower's Budget Bureau. This calls for a $750-million ceiling on the amount of bonds which could be outstanding at any time, and it would require Budget Bureau and Congressional review of each new TVA plant and each bond issue.

Neither of these plans would upset the traditional relationship between TVA and its customers, the municipalities and cooperatives who distribute the agency's power.

- The third proposal—one which has been tried before—would simply eliminate from all TVA contracts with its buyers the sole-supplier clause. This clause provides that when a city or a co-op buys TVA power, the buyer cannot obtain power from any other source. It is this clause which has helped TVA to keep all other suppliers out of its service area.

If the clause were to be prohibited from TVA contracts—and that is considered remote—there would be more building of municipally owned steam plants in the heart of the TVA service area, similar to the effort being undertaken by Memphis. Under these circumstances, TVA power would supply a part of a city's or co-op's load, and non-TVA plants would be built to take care of load growth. Memphis is able to go ahead because its 20-year power contract with TVA expires in 1958.

TVA Resale Rates . . . Coupled with elimination of the sole-supplier clause, some would like to see an end to TVA's right to set resale rates on the electricity it supplies its customers. But this, too, is considered unlikely. No legislation is pending to provide for it.

Congress won't act this year on any of these proposals. A House committee has postponed hearings twice because members have been tied up. They may get around to holding a few hearings before Congress adjourns for the summer, but with no final action.

Next year, an all-out effort will be made to enact some type of legislation to substitute for the present method of obtaining TVA funds each year from the public treasury. All sides will be extremely active in pushing their favorite plans, and a knock-down fight can be expected.

TECHNICAL NOTES

Cadmium copper, an alloy with ½ to 1% of the additive, is favorably regarded abroad for long spans. It has 150% the strength of hard-drawn copper and 80% of the conductivity.

Mid-point fuse in secondary banking should be rated 75 to 100% of rated secondary current of smallest adjacent transformer. Minimum is one size larger than largest service entrance fuses.

Mounting generator field on hydraulic runner as a spider offers unusually compact design, especially when mounted on horizontal shaft for low-head plants which may operate submerged during high water.

Lighting system operation and amortization in a schoolroom add about one cent to the average school cost of $1.50 per student per day.

Buried cable performance and life will be improved if surrounding soil of poor thermal conductivity is removed and replaced with soil of good thermal conductivity.

Petroleum coke made by a new fluid process promises merit as boiler fuel. Samples show 14,800 to 15,500 Btu/lb with 4-5% volatile, 5-7% sulphur, and 0.1-0.5% ash.

Computers gain new uses daily; newest is an electrical analog of the thermal aspects of human physiology.

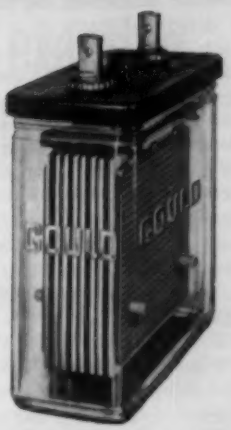
BATTERY MATERIALS COME THROUGH IN THE STRETCH!

BIG REASON WHY YOU GET MORE DURABLE BATTERIES FROM GOULD

Shown above is a tensile strength testing machine in the Gould Battery Research Laboratory at Depew, N.Y. It is capable of exerting a pull of 10,000 pounds on any material. Gould uses it to make sure that every component of a Gould Battery—grids, connectors, posts, jars—has strength and ruggedness far above required standards.

Thanks to this and many other instruments of research, Gould Batteries are capable of delivering better performance under any conditions of service.

For the full story on Gould Research, send for Booklet 749.



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The Aristocrat of
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GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

4 Types of Depreciation Examined

The four methods of treating accelerated depreciation were discussed recently before the Mountain-Pacific States Conference of Public Service Commissions, in Reno, Nevada. The examination of these procedures came in a paper by R. E. Larsen of the Idaho Public Utilities Commission.

After outlining the provisions of Section 167 of the Internal Revenue Code, Larsen quoted the Senate Committee Report which said: "The faster tax write-off would increase available working capital and materially aid growing businesses in the financing of their expansion. For all segments of the American economy, liberalized depreciation policies should assist modernization and expansion of industrial capacity, with resulting economic growth, increased production, and a higher standard of living."

Tax Deferral or Tax Saving

Larsen, in discussing the question whether accelerated depreciation was a deferral of taxes or a tax saving, said: "If a single item of property is taken as an example, there appears to be no question but what the Section 167 provisions result in a tax deferral . . . If the entire property of a utility is used as an example and certain assumptions are made, a case can be made for considering the results of accelerated depreciation as constituting a tax saving.

"The principal assumption is that the taxpayer makes the same or increasingly larger dollar expenditures for newly constructed property each year and the new property has the same composite life expectancy. If this assumption is accepted, together with the assumption that the provisions of the current Section 167 will continue in effect, the total amount of the depreciation deductions under an accelerated plan will never in any year fall below the total amount of depreciation which would be deductible under the straight-line method. Thus, under these circumstances and assuming no change in the tax rate, tax reductions obtained would never be offset by future tax increases and a tax saving would result."

In dealing with the relative merits of the tax deferral versus tax savings, Larsen pointed out, "The critics of the 'tax deferral' concept take the position that it is not logical to look at a single item without relating it to the whole and that attention must be focused on all of the many items composing the complex property of a regulated utility. Perhaps such critics would agree Amos and Andy's Fresh-Air Taxicab Co with its one taxicab is the only utility company that could use the tax deferral method without question.

"The critics of the 'tax savings' concept take the position that continual additions of new property each year of the same or larger dollar amounts to the plant just isn't a good assumption. First, the present level of construction of practically all utilities is at or near an all-time high, and second, advances in the art may well result in lower unit cost of property added. This latter effect would be progressive over the years."

In discussing the accounting treatment of accelerated depreciation, Larsen analyzed four methods. These were: The Industrial Method, The Flow Through Method, the Depreciation Reserve Method, and the Deferred Taxes Method.

Industrial Method

As to the Industrial Method under which the tax depreciation would be "booked", Larsen said: "The effect of this treatment would be to reduce net income below that which would result from the continuation of the present straight-line method for book and tax purposes and would also result in the accumulation of depreciation reserves at a higher rate during the early years of the service life of newly constructed plant than is now the case. The reduction in net income resulting from the application of this method would probably require utilities to seek higher rates."

In the Flow Through method the increased income resulting from the larger tax depreciation would be allowed to flow through to surplus. Larsen said: "This method would result in increased net income during the early years of the service life of newly constructed plant with possible rate reductions for customers during the early years but with the probable need in later years for rates higher than those currently in effect. The effect of this method would be to pass on the benefits to present day rate-payers at the possible expense of future rate-payers.

"Furthermore, the utility would not have the use of any free capital for expansion, which seems contrary to the intent of the tax law as discussed previously."

Depreciation Reserve Method

As to the Depreciation Reserve Method taxes would be "normalized" and the amount of the annual deferral credited to the Depreciation Reserve. In dealing with this method, Larsen said: "This method would keep net income normalized, but at the same time would increase both depreciation expense and the depreciation reserve abnormally for any particular generation of plant. The effect on the depreciation accounts might be desirable for utilities with inadequate reserves, because this method would build them up, but for those companies which already have adequate reserves it might have the end result of distributing the tax deferral or tax saving to the rate-payers through lowered depreciation rates. Free capital would only be available to the utility to the extent that book depreciation rates remained unchanged."

In the Deferred Taxes Method "normalized" taxes would be used and the amount of the tax deferral credited either to a tax reserve or an appropriated surplus. Larsen said: "The deferral tax method has been specifically approved by several commissions. Also it is consistent with rulings on amortization of defense facilities by many other commissions.

"This method would keep the net income comparable with present day conditions. The rate-payer would pay depreciation costs as at present, covering a pro-rata share each year of the original cost of the plant items. It would make free capital available to the utility. As such, this method in

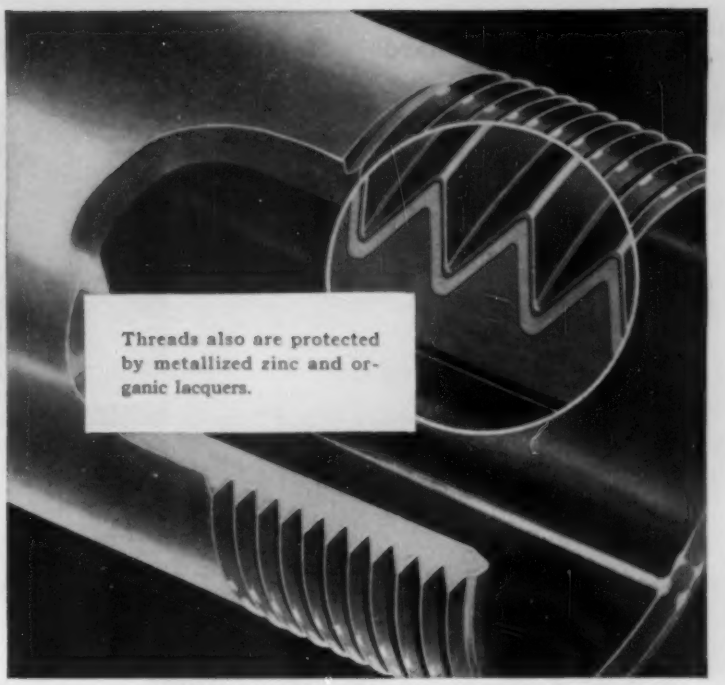
(*Continued on page* 208)

1,000 hours in a 20% salt spray at 95 F determines G-E White's resistance to corrosion effects of salt atmosphere.

Sulfuric and hydrochloric acid tests indicate superior resistance to the kind of corrosion common in industrial areas.

105 F and 100% humidity for 42 days, yet G-E White showed no signs of corrosion.

"Preece" test determines thickness and uniformity of zinc deposits. New G-E White exceeds the four dips in copper sulfate required by Underwriters' Laboratories, Inc.



How G-E White rigid conduit was engineered to meet exacting industrial specifications

Six months of intensive laboratory and field tests (see illustrations) show that General Electric rigid steel conduit resists corrosion from salt water atmospheres, smoke, heat, chemical fumes, humidity . . . show why G-E White is particularly well suited for industrial atmospheres. The metallizing process, adapted by General Electric engineers to zinc-galvanize G-E White, bonds a controlled, nonflaking coating of pure zinc to the entire exterior surface of the conduit—threads and all. The result is a smooth, ductile zinc coating superior to anything previously put on rigid steel conduit. In addition, the outside surface has the extra protection of a special organic coating.

Because of its ability to resist corrosion, G-E White is a favorite with contractors and maintenance men. Its easy bending and easy wire pulling characteristics simplify installation. For more information write Section C56-727, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Depreciation Examined

(*Continued from page* 206)

the long run would benefit the consumer. There is a further advantage that net income of future years would not be affected if repeal of the accelerated depreciation provisions should occur."

It is significant that while Larsen discusses accounting treatment of accelerated depreciation, it is apparent that such accounting treatment has rate-making implications. This situation is rather clearly illustrated in the discussion of the Flow Through method.

In conclusion, Larsen makes the plea that "With the uncertainties that exist, it appears that commissions would be well advised to defer, in so far as possible, taking any final stand on methods to be used in accounting for accelerated depreciation." And that "At this premature moment, the only basis which seems to have any chance of uniformity is the tax deferral method. This may change when more is known. Of course, if the tax deferral method is adopted, commissions that use an original cost rate base or a cost of capital approach to rate of return may wish to take the interest-free reserve into consideration. I understand that several commissions have adopted similar procedures in connection with the amortization of emergency facilities under Section 168 of the Code (Section 124A of the Revenue Act of 1939 as amended)."

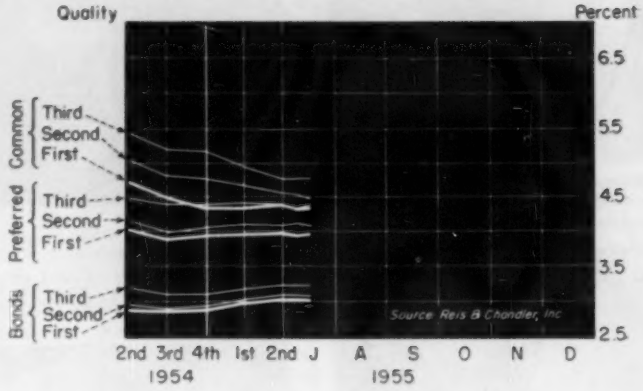
FINANCIAL BRIEFS

New England Gas & Electric Association has sold at par to six institutional investors $3.5 million 3¾% sinking fund collateral trust bonds due in 1980.

Illinois Gov William G. Stratton has signed a bill allowing cities to levy a 5% tax on utilities rendering electric, gas, telephone, telegraph, and water service. A companion measure to the utility bill is designed to permit utility companies to charge customers directly for the amount of the tax.

New York State Electric & Gas Co is planning to sell competitively in October $25 million in bonds.

Today's Utility Yields—(%)



	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
July 14	3.03	3.08	3.21	3.96	4.06	4.36	4.34	4.45	4.76
July 7	3.03	3.09	3.21	3.96	4.07	4.35	4.35	4.51	4.76

Utility Earnings

COMPANY	PERIOD MONTHS ENDED		NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
El Paso Electric	12	May	$2,141,387	$1,871,482	$2.39	$2.13
Iowa-Illinois Gas & Electric	12	May	4,885,669	4,231,814	2.34	2.07
Potomac Electric Power	12	May	6,638,100	6,434,300	1.21	1.17
Public Service of Indiana	12	May	12,437,053	11,959,259	2.44	2.33
South Carolina Electric & Gas	12	May	4,955,117	4,193,148	1.35(a)	1.28(a)
Southern Canada Power	8	May	1,110,761	1,047,056	....	....
Tampa Electric	12	May	3,326,288	2,642,556	1.50	1.23(b)
Washington Water Power	12	May	4,606,682	4,291,644	....	....

Notes—(a) Based on average number of shares outstanding, and (b) Adjusted to reflect the effect of stock split in December, 1954.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
JULY 14–20			
COMMON STOCK			
Consumers Power—373,689 sh (being offered commonholders on 1-for-20 basis, record July 21 to expire Aug. 5; unsubscribed stock to be offered to employees)	$16,909	$45.25	4.86%
SCHEDULED FOR JULY—AUGUST—SEPTEMBER			
BONDS			BID DATE
California Electric Power—1st mtg	$6,000	.....	Aug. 30
Essex County Electric—1st Mtg	18,000	.....	.....
PREFERRED STOCK			
Consumers Power—100,000 sh cum no par	$10,000	.....	July 21(a)
Southern Colorado Power—20,000 sh $50 par 4.72% cum	1,000	.....	July 27(b)
COMMON STOCK			
California Electric Power—230,000 sh	.....	.....	Aug. 23
Housatonic Public Service—14,817 sh (to be offered commonholders on 1-for-25 basis, record Sept. 5 to expire Sept. 26)	.....	.....	.....

Notes—(a) Morgan Stanley & Co group, underwriters, and (b) Stone & Webster Securities Corp—Paine, Webber, Jackson & Curtis, underwriters.

STATISTICS

The Housing Boom — Who's building what and where

New nonfarm dwelling units started — 000's

	Total	Private	Public	Metropolitan	Nonmetropolitan	1-family	2-or-More Family Structures
1946	670.5	662.5	8.0	na	na	590.0	80.5
1947	849.0	845.6	3.4	na	na	740.2	108.8
1948	931.6	913.5	18.1	na	na	766.6	165.0
1949	1,025.1	988.8	36.3	na	na	794.3	230.8
1950	1,396.0	1,352.2	43.8	1,021.6	374.4	1,154.1	241.9
1951	1,091.3	1,020.1	71.2	776.8	314.5	900.1	191.2
1952	1,127.0	1,068.5	58.5	794.9	332.1	942.5	184.5
1953	1,103.8	1,068.3	35.5	803.5	300.3	937.8	166.0
1954	1,220.4	1,201.7	18.7	896.9	323.5	1,077.9	142.5
first 4 months 1954	344.5	338.7	5.8	253.7	90.8	297.1	47.4
first 4 months 1955	421.6	418.5	3.1	311.7	109.9	na	na

split about 3 to 1 met over non-met

82% 89% 85% 88%

a rising trend — family units!

while a drop here

22.4% higher than last year

private building provides all the increase — 98.5% of all units last year

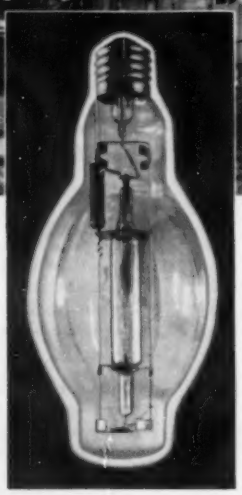
source: U. S. Dep't of Commerce, Business & Defense Services Administration

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	May	106.32	105.30	93.81	13.3
Peak—Class I Systems (million kw)	Apr.	82.4	83.4	73.7	11.8
Estimated Dec. '55 Peak	Mar.	96.5	96.4	96.0	0.6
Production—billion kwhr	May.	43.35	42.03	37.43	15.8
hydro		9.81	10.47	10.35	−5.1
fuel		33.54	31.56	27.08	23.8
Sales—billion kwhr	Apr.	39.56	39.94	34.13	15.9
residential		10.54	11.08	9.57	10.1
commercial		6.14	6.20	5.69	7.9
industrial—includes sales to AEC		20.51	20.36	16.73	22.6
other		2.37	2.29	2.12	11.6
Fuel Consumption	May.				
coal—million tons		10.76	10.12	8.67	24.1
oil—million barrels		4.88	5.68	4.25	14.9
gas—billion cu ft		103.43	92.82	94.70	9.3
Net Income Class A & B Co's—$ million.	Apr.	105.46	107.80	95.87	10.0
Residential Customers—millions	12 mos.	43.44	43.35	42.15	3.1
revenue per kwhr	ended	2.68¢	2.68¢	2.72¢	−1.5
avg. kwhr per customer	Mar.	2,606	2,587	2,400	8.6
avg. annual bill		$69.84	$69.33	$65.28	7.0

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	June	138	138	124	11.3
ENR Construction Cost	June	137.5	137.0	130.5	5.4
BLS Cost-of-Living	May	114.2	114.2	115.0	−0.7
NEMA Sales	May				
insulation materials		154	160	116	32.8
electric appliances		110	105	89	23.6
household refrigerators		104	96	74	40.5
Wholesale prices	May				
motors and generators		120.8	120.5	124.1	−2.7
transformers and regulators		127.3	127.3	128.1	−0.6
switchgear and fuses		135.6	135.5	135.1	0.4
GNP—annual rate—$ billion	1st Qtr.	$370.0	$362.0	$355.8	4.0



Now you can have both!

✓ The high efficiency of Sylvania Mercury Vapor Lighting

✓ Improved COLOR as well

If you have been hesitating about installing high-efficiency Sylvania Mercury Vapor lighting because of its inherent color—you need wait no longer!

Sylvania phosphor-coated mercury vapor lamps, used in standard mercury vapor circuits, will give greatly improved color rendition that is adequate for most applications. If still better color is needed, combine Sylvania mercury vapor lamps with Sylvania fluorescent lamps in lower-mounted fixtures—up to 40 or 50 feet. For high mounting heights, combine Sylvania mercury vapor with Sylvania incandescent lamps.

When you combine mercury vapor with fluorescent or incandescent lighting, you gain another important advantage, too . . . greater protection in the event of momentary power interruption.

So . . . there is no longer any need to hesitate because of *color*. Get the real economies that only mercury vapor lighting can give you—*plus* improved color through Sylvania phosphor-coated lamps or regular high-output Sylvania mercury vapor lamps in combination with Sylvania fluorescent or incandescent.

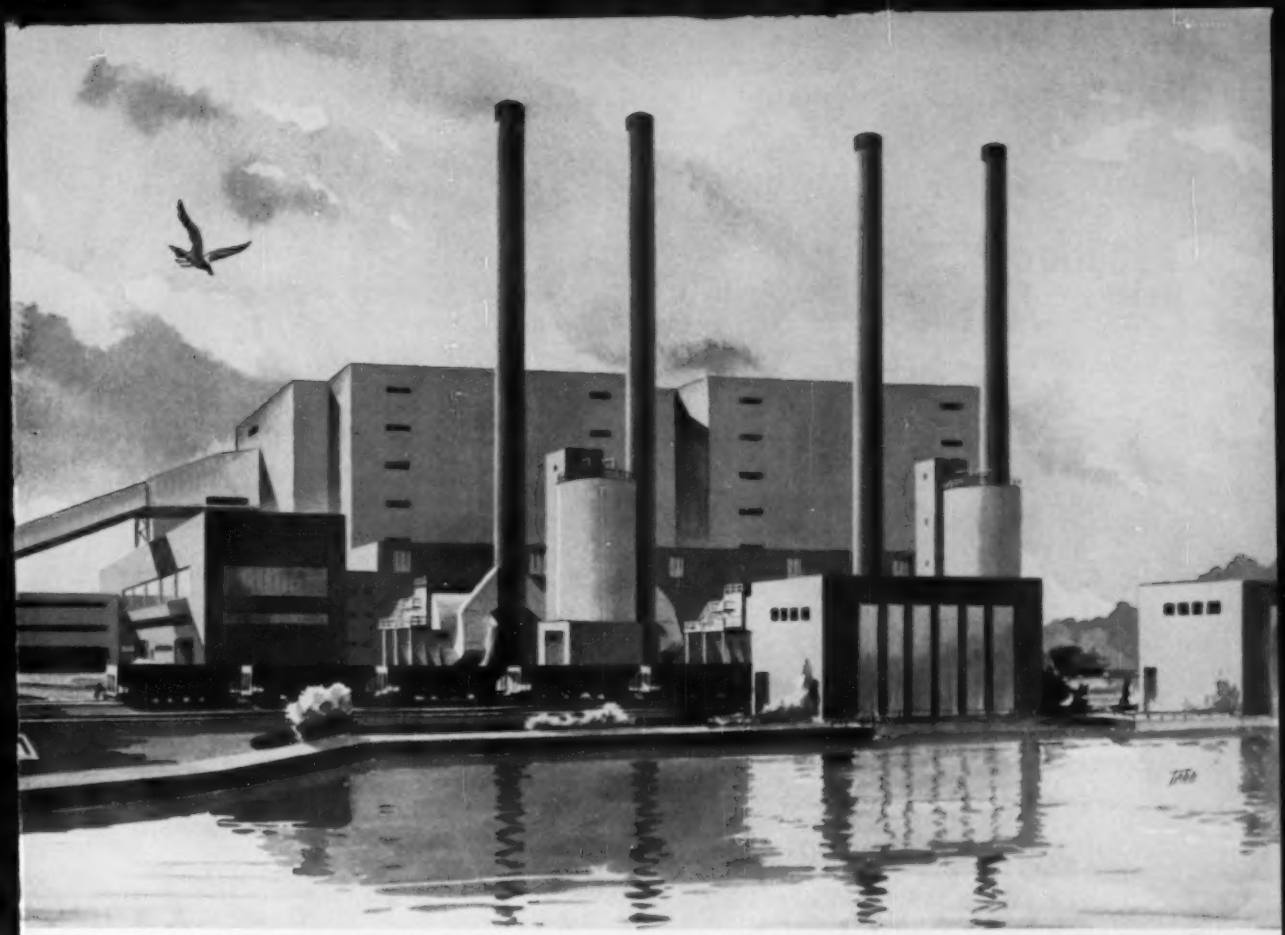
Sylvania's Lighting Engineering Department will gladly help you plan your mercury vapor installation. For complete information and application data, write to:

SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, Salem, Mass.
In Canada: Sylvania Electric (Canada) Ltd., University Tower Building, St. Catherine Street, Montreal, P. Q.

SYLVANIA®

. . . fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY



New 625,000 kw plant! In October, 1954, Detroit Edison Company put into operation its most up-to-date power plant. In 50 years, the utility has upped its total generating capacity 400 times to a total of more than 2½ million kilowatts!

DETROIT EDISON ASSURES INSTANTANEOUS POWER FOR SWITCHGEAR with Exide®-Manchex® Batteries

Whenever Exides are used, positive switchgear performance helps to assure service continuity. That's why they're chosen so often for controlling circuit breakers in plants like the Detroit Edison Company's St. Clair station shown above.

EXIDE-MANCHEX FEATURES:

DEPENDABLE POWER which assures instant operation of circuit breakers

LARGE RESERVE OF POWER for all control circuits and emergency lighting

STATE OF CHARGE EASILY DETERMINED by simple hydrometer reading

NO ELECTROLYTE CHANGE during entire life of battery

LOW COST MAINTENANCE—water needed only twice a year

LARGE CAPACITY IN SMALL SPACE

EXCEPTIONALLY LONG LIFE...low cost for owning and operating

These are the performance and operating features of the Exide-Manchex battery which make it your best power buy—AT ANY PRICE.

Get more details! Send for Bulletin 210—valuable facts on Exides used for switchgear control, emergency light and power. For complete battery engineering service, call your nearby Exide branch office.

Exide-Manchex Batteries, like those relied upon at the new St. Clair plant of Detroit Edison Company, are also used by electric utilities all over the country. Exide-Manchex batteries are your best switchgear power buy—AT ANY PRICE!

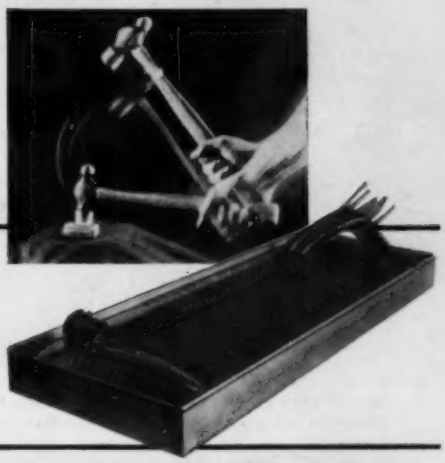
Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

NEW Silco-Flex MOTOR INSULATION

Offers These Amazing Physical Properties

Allis-Chalmers, working with Dow Corning Corporation, has developed *Silco-Flex* motor and generator insulation . . . truly new in concept . . . truly new in effectiveness.

Silco-Flex insulation employs a pure silicone rubber combined with specially developed application techniques to produce an insulation unmatched by any other in use today.



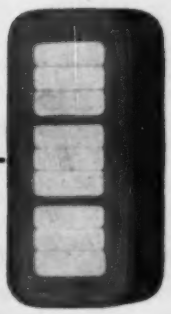
● **Flexibility and Resilience** — *Silco-Flex* insulation remains flexible and resilient indefinitely. It is especially resistant to mechanical abuse and to stresses of overloading, rapid starting and stopping.

● **Moisture Resistance** — Completely sealed, *Silco-Flex* insulated coils are the most moisture-resistant commercial coils ever produced. They are production-tested while submerged in water . . . by far the most complete and searching high potential test used.

● **Abrasion Resistance** — Samples of insulation at right show effects after sandblasting with 90 grit aluminum oxide and 100 psi air for one minute. Nozzle-to-sample distance was six inches, thickness equivalent to 2300-volt insulation. Note difference in abrasion!

Silco-Flex Insulation | Polyester Mica Tape | Asphaltum Mica Tape

● **Homogeneity** — *Silco-Flex* insulation is a void-free dielectric barrier vulcanized into a unified insulating wall. It maintains its homogeneity under extremes of differential expansion and contraction due to thermal cycling.



Other Advantages include exceptionally good thermal stability and chemical inertness. *Silco-Flex* insulation is also a much better heat conductor than ordinary electrical insulating materials. Moreover, enclosures now required to protect windings from moisture and abrasion may be eliminated in many cases.

New *Silco-Flex* insulation is immediately available for all Class H form-wound coils and for Class A and B windings operating under selected service conditions. For complete information, call your Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

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